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**SUBMISSION TO
THE ROYAL COMMISSION ON ENERGY**



IMPERIAL OIL LIMITED

MAY, 1958

Exhibit CC-5-2.

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CONTENTS

	INTRODUCTION - - - - -	3
I.	THE COMPANY - - - - -	4
II.	CHARACTERISTICS OF THE PETROLEUM INDUSTRY - - - - -	6
III.	CRUDE OIL RESERVES, PRODUCIBILITY AND FACTORS AFFECTING DEVELOPMENT - - - - -	8
IV.	DEVELOPMENT OF CRUDE OIL MARKETS AND ECONOMICS OF NEW MARKET PENETRATION - - - - -	12
V.	THE CURRENT DECLINE IN CRUDE OIL MARKET - - - - -	21
VI.	FUTURE MARKET ALTERNATIVES - - - - -	24
VII.	OIL PIPE LINE FINANCING AND REGULATION - - - - -	35
VIII.	NATIONAL ENERGY POLICY AND NATIONAL ENERGY AUTHORITY - - - - -	39
	SUMMARY AND CONCLUSIONS - - - - -	42
	APPENDIX "A" - - - - -	46
	APPENDIX "B" - - - - -	48
	APPENDIX "C" - - - - -	56
	APPENDIX "D" - - - - -	67



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INTRODUCTION

The submission of Imperial Oil Limited will deal in varying degrees with points A, B, C and E* of the terms of reference of the Commission. Perhaps the chief value in this presentation will be derived from its description of the industry, of how the industry works, the various forces that have caused it to take today's shape, and hence some discussion as to what might improve its operations. With this background, it might be possible then to offer some suggestions on the particular points that the Commission has been asked to study.

It might be appropriate for us to define here the elements that we believe best serve the national interest in the sense used in the terms of reference of the Commission. These are as follows:

1. A high level of energy consumption by Canadians.
2. The existence of large resources of energy sources at the disposal of the Canadian economy.
3. The development of markets which will provide reasonable economic stimulus to the growth of the energy industries.
4. The development of energy resources in line with markets available to provide not only energy required but stimulus to the economic development of the country.

X | Our presentation is concentrated on the oil aspects of what is commonly referred to as the oil and gas industry. The identity between oil and gas exists solely in the producing and exploration phases. These two forms of energy, after production, are transported and sold under very different business systems and seldom have further contact until they meet competitively in the fuel market.

Of particular importance in this presentation is the discussion relating to the long-term as opposed to the short-term phases of the problem. These two may not necessarily be compatible, and historically long-term considerations have been the more important.

Any value that may be derived from this written presentation is believed to lie in a reading of the discussion. This makes the preparation of a summary and conclusions more difficult than is usually the case. Such a summary, however, has been prepared and is located at the back of the book where it may serve to remind the reader of some of the more important points discussed.

The submission is divided into the following sections:

- I. The Company
- II. Characteristics of the Petroleum Industry
- III. Crude Oil Reserves, Producibility and Factors Affecting Development
- IV. Development of Crude Oil Markets and Economics of New Market Penetration
- V. The Current Decline in Crude Oil Market
- VI. Future Market Alternatives
- VII. Oil Pipe Line Financing and Regulation
- VIII. National Energy Policy and National Energy Authority

*Terms of reference:

" . . . to enquire into and make recommendations concerning:

- (a) The policies which will best serve the national interest in relation to the export of energy and sources of energy from Canada;
- (b) the problems involved in, and the policies which ought to be applied to, the regulation of the transmission of oil and natural gas between provinces or from Canada to another country, including but without limiting the generality of the foregoing, the regulation of prices or rates to be charged or paid, the financial structure and control of pipe line corporations in relation to the setting of proper prices or charges, and all such other matters as it is necessary to enquire into and report upon, in order to ensure the efficient and economical operation of pipe lines in the national interest;
- (c) the extent of authority that might best be conferred on a National Energy Board to administer, subject to the control and authority of Parliament, such aspects of energy policy coming within the jurisdiction of Parliament as it may be desirable to entrust to such a Board, together with the character of administration and procedure that might best be established for such a Board;
- (e) such other related matters as the Commissioners consider it necessary to include in reporting upon those specified above.

I. THE COMPANY

Imperial Oil Limited was incorporated by letters patent granted by the Dominion Government in 1880. The Company's business is comprised of the production, refining and distribution of petroleum and its products throughout Canada. The entire assets of the Company are within Canada, and its operations extend to virtually every part of Canada. The Company's employees number approximately 14,000, and capital employed as of December 31, 1957 amounted to \$757.9 millions.

The Company is managed by a board of directors, who have the ultimate responsibility for the business of the Company. The directors, at present ten in number, are elected at the annual general meeting of shareholders, and the executive officers of the Company are the president and four vice-presidents, who are elected by and subject to the board of directors. Of Imperial's ten directors, eight are native-born Canadian citizens, one is a United States citizen and one is a Canadian citizen born in England. Eight of the directors have had more than twenty years of service apiece with the Company. All directors are full-time employees of the Company.

The Company's authorized capital is 40 million shares of no par value, of which approximately 31.5 million shares are issued and outstanding. The Company has some 44,500 shareholders of whom 35,300 are in Canada. Standard Oil Company (New Jersey) is the largest shareholder of the Company, owning about 70 percent of the outstanding shares. The distribution of shareholders and of shareholdings as at December 31, 1957 is shown in the following table:

						Shareholders	Shares		
Total -	-	-	-	-	-	44,544	100%	31,442,652	100%
Standard Oil (N.J.)	-	-	-	-	-	1		21,961,395	69.8%
Canadian Accounts	-	-	-	-	-	35,300	79.25%	6,289,283	20%
Other	-	-	-	-	-	9,243	20.7%	3,191,974	10.1%

CANADIAN CHARACTER OF IMPERIAL

In view of the fact that a majority of Imperial Oil Limited stock is held by a United States corporation, the question may well be asked to what extent Imperial is a "Canadian" company.

This question in effect means "Are Imperial's policies determined by external considerations or does Imperial base its policies on Canadian conditions and the Canadian interest?"

We believe the record speaks for itself, and the answer is that Imperial acts as a truly Canadian company. This basis of operations has never been questioned by shareholders, large or small, since it is the only way to maximize over the years the earnings from our operation.

The only workable principle on which the management of an operating company such as Imperial can adequately function is the energetic pursuit of the opportunities in its field. The management of an operating company will have to work diligently to keep abreast of competition under the best of circumstances. If arbitrary external objectives are introduced, the ability of such a company to compete deteriorates markedly.

This is perhaps merely a restatement of the importance of decentralized management in the operation of large enterprises. While there is a great diversity in the extent to which individual concerns practise this approach, its importance is widely recognized throughout industry today. It is probable that no individual concerns have had a greater experience in the principles and practice of decentralized management than Imperial Oil and its major shareholder, Standard Oil of New Jersey.

One reason for this lies in the fact that Imperial Oil Limited incorporated in 1880, is actually older than Standard Oil Company (N.J.). Imperial's relationship with Standard began in the '90s,

after Imperial had sought in vain for growth capital in Canada and the United Kingdom. Ultimately the financial problem was solved through the sale of a controlling interest to Standard Oil in 1898.

The affiliation thus initiated was, therefore, not of the parent-branch plant variety but one between two experienced oil concerns, both operating in highly developed communities. American-born personnel presently on the Company's payroll number less than one percent and are confined to a few specialists who, speaking generally, have brought a wealth of experience to Canada and have contributed greatly to Imperial's progress. They have been enlisted on the basis of their personal qualifications and not in the sense of shareholders' representatives.

Imperial was for many years headquarters and majority shareholder of International Petroleum Company, operating crude oil production and exploration in South America. Only with the prospect of Imperial's own large-scale crude production, following the discovery at Leduc, did this successful international relationship come to an end.

At that time Imperial sold its International Petroleum holdings to finance Canadian development. It is worth noting that Imperial sold this foreign operation, with large established crude oil reserves in order to finance its development of western Canadian crude oil supplies, which have displaced crude oil from affiliated companies. Before selling, however, Imperial obtained assurance of continued crude oil supplies to its east coast refineries.

II. CHARACTERISTICS OF THE PETROLEUM INDUSTRY

During the twentieth century, with the development of the internal combustion engine, automatic heating and the general increase in energy requirements, reflecting improved living standards, the oil industry has emerged as a major supplier of energy, even in countries with large coal resources. Thus in 1957 the free world used some 15 million barrels daily of crude oil and petroleum has become the largest commodity of world trade.

In this growth, the oil industry has developed an intricate and worldwide logistical system utilizing specialized transportation. Supply competition and freedom to "shop" is a predominant characteristic of the industry due to a number of factors:

- (a) The production of crude oil is concentrated in a few major areas as indicated by the following table:

										Free World Figures	
										% Production	% Reserves
Middle East	-	-	-	-	-	-	-	-	-	23	72
Venezuela	-	-	-	-	-	-	-	-	-	18	7
United States											
Texas	-	-	-	-	-	-	-	-	-	20	
California	-	-	-	-	-	-	-	-	-	6	
Mid-Continent	-	-	-	-	-	-	-	-	-	6	
Other	-	-	-	-	-	-	-	-	-	15	
										47	14
Canada	-	-	-	-	-	-	-	-	-	3	1
Other	-	-	-	-	-	-	-	-	-	9	6
										100	100

- (b) Widespread use of petroleum includes domestic customers, public utilities, industry and transportation facilities, requiring various specialized fuels. Major industries are frequently located on the basis of accessibility to a number of different oil sources.
- (c) Great flexibility in supply is needed because of the varying demand by types of product, the important and unpredictable effect of weather, and the normally long transportation lines. Consequently, an inadequate margin of supply could result in violent price fluctuations which would not only cause hardship at the consumer level but dislocation of industry. To protect against such eventualities, surplus capacity is maintained at all stages of the industry's operation, from oilfield through the transportation network to refining and distribution facilities. Surplus capacity has been a normal characteristic of the oil industry at all times except during highly abnormal conditions of world wars.

The fact that the oil industry has been able to develop and maintain surplus capacity over many years reflects the competitive nature of the industry on the North American continent. No monopoly has been able to do this in any country where such monopoly exists, such as the Argentine, Brazil, and Mexico. At the same time, the industry has been able to continuously enlist the confidence and support of outside capital to supplement internally generated funds in meeting the investment needs of the industry.

In Canada, since the end of World War II, capital investment by the oil industry has totalled some \$4,600 millions. While approximately two-thirds has been invested in crude oil exploration and development, investment in all phases of the industry has been essential to supply increasing demands

of the consumer for petroleum energy. This investment has been made by hundreds of companies and individuals.

Expenditures for exploration and development alone in western Canada have been currently running at a rate in excess of \$600 millions annually and net cash input is probably \$200 millions annually. This capital inflow obviously represents the investors' choice of Canadian opportunities for crude oil discovery and development rather than those elsewhere. Imperial's former interest in Latin America, and its decision to put this money into Canada, represented considered judgment between two investment opportunities. The Canadian producing industry, like every other producing area, competes for capital on the basis of profit incentive, geological prospectiveness and political stability.

Such capital is supplied to the industry by :

1. the individual investor directly, or
2. through one of his institutions.
3. by the shareholder's willingness to leave earnings in the business.

Incidentally, financial institutions and oil companies have capital to invest only so long as the individual investor retains confidence in the wise direction of their affairs.

Both individual and institutional sources of capital recognize all the fair and reasonable obligations of the oil industry: payments for the right to explore to owners of prospective oil-bearing properties, governments or individuals; royalties — a share in the profits of production; fair wages for employees and payments of taxes to local and federal authorities. Investors understand the desire of government to watch over natural resources, but are wary of regulations which may interfere with natural economic movements. Capital — the savings of the individual — is only forthcoming if a reward can be expected within a reasonable time.

If denied this by excessive taxation, unreasonable regulations or poor management, capital will turn to another industry, another country. The freedom of capital to move is its greatest asset — confine this freedom, restrict or prolong its reward and capital will no longer be available.

In summary, three petroleum industry aspects stand out: the first is competition within the industry itself; the second is the heavy capital input; and the third is the importance of exploration incentive. All three are essential to maximum development of oil resources.

III. CRUDE OIL RESERVES, PRODUCIBILITY AND FACTORS AFFECTING FUTURE DEVELOPMENT

The producing phase of the Canadian oil industry, including the exploration for, and the production of crude oil and natural gas, can be assessed at a *given* time in terms of current reserves, producibility and net cash flow. However, future reserve development, and continuity of supply to the market depends on continuing exploration which, in turn, depends on incentive . . . that is the prospect of profit from future discovery.

Accordingly, future development of Canadian oil resources as a major energy source is not only a matter of the current position but even more important of the factors affecting future incentive.

The following section considers these aspects with detailed supporting material including case studies, presented in the indicated appendices.

It is first necessary to describe the “business system” in which exploration and development is conducted. The producing industry in Canada operates under certain competitive and legal concepts which can be summarized in four basic characteristics:

- I. Sound conservation practices are observed in the production of crude. These practices include “equitable share allowable” and “market demand proration.”
- II. As a practical matter, exclusive rights to explore with surface equipment cannot be obtained and surface exploration is freely done on a non-exclusive basis.
- III. Mineral rights are generally leased under a “drill-pay-or-quit” lease, the terms of which promote exploration, because:
 - (a) An annual rental serves as an economic pressure to evaluate land by exploration.
 - (b) Usually there is no obstacle to the division of the lease interests, any portion of which may be sold or traded.
 - (c) Drilling must be started (and continued) if production is found in adjoining lands.
- IV. It is the present policy of provincial governments to grant leases by generally following a pattern of:
 - (a) Granting an option (reservation) to lease half the acreage in a block of government land — provided certain exploration work is done.
 - (b) Selling by sealed tender any part of the residue of subsurface rights from (a).
 - (c) Granting leases whose terms promote exploration as briefly described in III.

All of these characteristics have one thing in common — they promote rapid development and exploration by the industry, because they foster intense competition. It is inherent in this situation that the oil industry explores and develops considerably ahead of available market outlet. Individual reserves cannot be retained or development deferred as in the case of solid or non-migratory minerals.

With this background, we can consider the physical indices of reserves, producibility, and questions of producing economics:


RESERVES (Appendix A)

The reserve estimates made by the Canadian Petroleum Association and Imperial Oil Limited for crude oil are summarized below; they are considered to be in good agreement.

									Canadian Petroleum Association	Imperial Oil Limited
									(Billions of Barrels)	
Proved remaining	-	-	-	-	-	-	-	-	2.86	2.75
Probable remaining	-	-	-	-	-	-	-	-	3.68	3.77
Possible	-	-	-	-	-	-	-	-	50.	27- 45

PRODUCIBILITY (Appendix B)

“Possible” reserves of oil will only be discovered and developed over an indefinite period of many years. Our primary concern is the rate of discovery and the producibility, or maximum efficient daily production, that might be available during the next five or six years. Estimates of producibility for this period have been developed, as shown in Appendix B, resulting in the following figures:

- 
- (a) At the beginning of the year 1958, total Canadian crude oil producibility amounted to 935,000 b/d.
 - (b) By the beginning of the year 1960, total crude oil producibility might amount to about 1,050,000 b/d.
 - (c) By the end of the year 1963, total crude oil producibility will range between 1,350,000 and 1,550,000 b/d.

These figures in all cases include light, medium and heavy crude oil and it should be noted that up to 10 percent of these gross volumes could be in the medium, heavy, or “sour” classification which have more limited market possibilities than sweet light crude oil.

Imperial’s submission to the Gordon Commission (prepared three years ago) predicted an industry producibility in excess of 1.3 million barrels a day for 1960, whereas the present forecast for 1960 is just over 1 million barrels a day. While this difference may seem large, experience has shown that in this type of forecasting such variations can occur when looking ahead five years as in the case of our earlier estimate for 1960: however, the range and likely variation naturally narrows as the forecast date approaches. In Appendix B, the basis for the current estimate is given. It will be noted that many of the factors which are critical to the estimate are based on judgment and knowledge as of a given date. Generally speaking, independent estimates of the ability to produce crude oil from “existing” wells are usually in reasonably close agreement. The variation occurs in the estimate of future production from reserves that are yet to be discovered. In the shorter term, finding rate is dependent on past, rather than future exploration activity. Accordingly, the conclusion developed in Appendix B is that:

- (a) Between now and 1960, changes in the rate of exploration activity and the timing of large discoveries should *not* substantially affect this producibility forecast.
- (b) By the end of 1963, a producibility range of between 1.35 million barrels per day and 1.55 million barrels per day is indicated, after considering a variation in exploration activity ranging from 20 percent above to 20 percent below present level. These estimates could be affected by the incidence of large discoveries, although there is a considerable time lag between discovery and the full production impact of such large discoveries.

PRODUCING ECONOMICS AND PROFITABILITY (Appendix C)

Net cash recovery or input of the overall producing industry at a given time is not a true reflection of profitability. The industry is a composite of many individuals and companies with widely different resources, positions and prospects. Gross rate of industry expenditure and cash input is determined mainly by future prospects and long range programs. Consequently, profitability and future cost/price relationships must be examined on the basis of unit values (dollars per barrel) which is the investors' criterion of exploration incentive.

We have estimated such figures, as shown in Appendix C, on the basis of industry averages and specific case studies which bring out the following points:

- (a) Current estimates of crude oil replacement costs and profitability in western Canada show that *on average* the producing industry is earning a return of 7-12 percent. This rate must be considered a modest return on risk capital and no more than sufficient to attract new money at normal success ratios.
- (b) Future cost/price relationships which will determine incentive and consequently the basis for future exploration, are chiefly governed by:
 - (i) Finding or acquisition costs which vary widely between producers;
 - (ii) Realization for crude oil at the wellhead which is affected by length of transportation to markets and competition at the point of sale.
- (c) Acquisition or finding costs may be expected to increase in Canada as the area matures. At the same time, Canadian crude is already at a 30/45¢/barrel disadvantage in wellhead price versus U.S. and Venezuelan crudes due to the long overland distances to markets.
- (d) The further narrowing of cost/price relationships is a matter of serious concern in relation to the supply of equity capital (including retained earnings) which is the only source of risk capital for exploration.

SUMMARY

The major consideration in the development of Canadian crude oil resources is exploration incentive, which involves judgment as to prospectiveness and future cost/price relationships. The following should be recognized in assessing the Canadian industry situation:

- I. Exploration, to be effective on a large scale, must be reasonably continuous; it cannot be turned off or on, as in the case of many other minerals, because:
 - (a) Specific exploration ventures, even in limited areas, usually require several years of work.
 - (b) Very often, success, when it is achieved, comes from restudy and reinterpretation of work done in past years.
 - (c) Despite great advances in geological and geophysical techniques, no positive oil-finding tool exists today. The only conclusive test is the drill. Only 20 percent of the exploratory wells drilled in western Canada have discovered commercial oil and gas reserves.
- II. For the reasons given above, oil producibility in the immediate future is a reflection of *past, not current*, exploration activity.
- III. Exploration in the long term future, on a sound, continuous basis, is dependent on profit incentive, the competitive system, the exploring force and favorable geology, all of which must be present. In western Canada today, only "incentive" need be discussed.

IV. Profit or incentive is primarily a price/cost relationship. In the producing industry, just as in any other business, this relationship is influenced by ups and downs in general price levels. In the western Canadian producing industry, there are three factors which merit special comment on this price/cost relationship:

- X /
- (a) Within the industry, profit incentive is not a conventional relationship of volume multiplied by unit of realization. The volumes are determined by proration; consequently, incremental increases or decreases in the total crude outlet do not accrue to one company in the same way as they do to another.
 - (b) The western Canadian producer is realizing a price at the wellhead which is 30 to 45 cents per barrel less than other Western Hemisphere crudes. This fact alone should be a real indication that any substantial sacrifice in realization would take away the exploration incentive. It is even more pertinent when it is looked at along with the average industry profit margin estimates which currently appear to be little more than adequate to encourage continued exploration.
 - (c) The cost of finding is probably increasing, although the rate of increase cannot be reasonably estimated from the limited information and the inherent annual variations. Thus long term future exploration incentives might be somewhat limited if judged on current realizations.

Thus Imperial's analysis indicates that the Canadian oil industry must carefully guard against any action that would permanently further depress crude oil realization relative to that in other areas.

{ Of major importance in the profitability of the producing industry, and which cannot be covered in detail in this submission, are the present regulations in respect to depletion allowance. This matter has been the subject of many representations to the federal government authorities by the Canadian Petroleum Association and individual companies over the past ten years, and complete studies have been made available to the Department of Finance. In essence, the present depletion allowance regulations as interpreted by the government allow depletion *after* the deduction of total exploration costs, and this is a substantial penalty to the Canadian producer, as compared to producers of competitive crudes. In short, the U.S. depletion allowance, which is more favorable than that in Canada, is available to U.S. companies no matter where they are operating. Thus to the wellhead price disadvantage, which the Canadian producer presently suffers, must be added the net effect of additional taxes.

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IV. DEVELOPMENT OF CRUDE OIL MARKETS AND THE ECONOMICS OF NEW MARKET PENETRATION

Prior sections of this submission have emphasized the importance of exploration incentive to the producing industry and this, of course, is affected by markets. The growth of the market for Canadian crude oil to its present expanse, extending some 2,600 miles from the Pacific coast to Toronto, is virtually a textbook case of market penetration by a new crude supply source. Since 1947, refinery and transportation facilities have been created to market Canadian oil at a pace perhaps never equalled in the development of a new producing area.

It is pertinent to examine this development, recognizing that no other land-locked producing area in the world has succeeded in extending its marketing area so far. The discovery of Leduc and then Redwater as major oil reserves established the prospectiveness of the western Canadian basin and almost immediately brought up the problem of finding markets beyond the local prairie requirements.

The decision to move oil to Ontario, involving a substantial price reduction to the producer, was the major marketing step which established the present competitive area of Canadian oil. This decision and the creation of the Interprovincial Pipe Line system was only undertaken after full consideration of long range trends in world production and consumption. The creation of such a large system depended on guaranteed refinery demand and accompanying financial guarantees, plus access to future consuming areas within economic penetration of Alberta crude oil.

Canadian crude oil reached its present orbit in the three stages outlined below. It should be noted that each step involved various long term commitments by individual companies; that the major crude price gamble was, and still is, the penetration of the Ontario market; that equitable sharing of the crude oil market, necessitated by conservation requirements, leaves an unequal burden on certain companies; and finally, that all these steps have followed a pattern of providing access for Canadian crude to markets with long term growth potential.

In telling the story from Imperial's standpoint, we apologize for not adequately dealing with the efforts and activities of others. However, first-hand information from one company's files should be of value, and we feel that the record should be presented in further answer to the question discussed in our introduction as to the Canadian character of Imperial's policies. As the record is traced, it will, we hope, be evident that where Imperial has had confidence in the long-range soundness of a market for Canadian crude it has not hesitated to assume great financial risks and has repeatedly backed out imports of oil purchased from affiliated companies as the opportunity to use Canadian oil has expanded. These steps have been taken despite the fact that to an increasing degree the Canadian crude oil has come largely from the wells of the many other producers active in western Canada.

HISTORY OF WESTERN CANADIAN CRUDE MARKET DEVELOPMENTS

Prairie Market

The first phase of a major program to expand the markets for Canadian crude oil following the discovery of the Leduc field was the saturation of the prairie provinces market.

From self-sufficiency during the years when Turner Valley was most productive, the prairie area had become increasingly a deficiency region from about 1940. The prairie market during the year 1947, when the Leduc field was discovered, required imports of 20,100 barrels per day of crude oil to augment the local production of 19,500 barrels per day. It also required the import of 2,000 barrels per day of products from United States and shipment of 10,800 barrels per day of products from eastern Canada. The prairie supply problem at that time was one of major economic significance for consumers as well as the oil industry.

The first step in utilizing the new production of the Leduc and other fields in the Edmonton area, of course, was to displace imported crude oil at the Calgary, Regina and Moose Jaw refineries. The production was in great demand by all the local refineries to back out expensive imports and no sales initiative was required by the producers. It was essential to install quickly adequate field gathering and tank car loading facilities. Imperial Pipe Line Company undertook the initial task with despatch investing \$5.4 millions by 1950, a figure which has since been almost doubled.

The speed with which Alberta production backed out prairie crude oil imports and supplied expanding refinery capacity is illustrated by the following table:

	1947	1948	1949	1950	1957
		(thousands of barrels per day)			
Prairie refinery runs:					
Canadian crude - - - - -	18.5	31.8	54.6	71.8	151.3
U.S. crude - - - - -	20.1	14.0	2.5	.6	—
Total crude runs - - - - -	38.6	45.8	57.1	72.4	151.3
Products from U.S. and eastern Canada - -	12.8	11.9	14.6	8.0	4.0

The foregoing table also indicates the second phase of saturating the prairie market which was to displace product shipments into the area from the United States and eastern Canada. By 1950 new refining capacity, built for this purpose, raised crude requirements by 33,800 barrels per day. The growth of the local market was so great, however, that it exceeded local refinery supplies by 8,000 barrels per day of products in 1950. There is now ample refining capacity to meet the current prairie demand of 145,000 barrels per day. The 1957 imports are mostly aviation gasoline and specialty products not available from local refinery production.

This prairie refinery expansion program was a major industry undertaking involving capital expenditures since the discovery of the Leduc field of between \$180 and \$200 millions. Imperial's part in this program involved building new refineries in rapid sequence at Edmonton and Winnipeg, and expanding materially the capacity of the Regina refinery.

The most dramatic step was the movement of the war-built Whitehorse refinery down the Alaskan Highway for re-erection at Edmonton. The initial cost of this plant was \$11.7 millions. It was soon expanded and now has a capacity of 28,500 barrels per day, representing a capital investment of \$34.5 millions.

The Winnipeg refinery made a major contribution toward expanding the market for Alberta crude. It displaced the movement of Ontario products into eastern Manitoba. This plant cost initially \$9.9 millions and has been subsequently increased to a total capital investment of \$15.3 millions. Additional capital expenditures of \$12.4 millions have been made at Regina and \$17.4 millions committed at Calgary since the Leduc discovery.

Imperial also leased the old North Star refinery at Winnipeg and financed the \$300,000 cost of adding to its capacity pending the completion of its Winnipeg refinery. Imperial undertook a firm crude oil commitment to provide the supply assurance required to justify the building of a new refinery at Edmonton by McColl-Frontenac, even though crude reserves were not then proven to support this commitment. All this added refinery capacity resulted in more residual fuel production than the market could accommodate. To cope with this situation, Imperial undertook to bear a substantial part of the railways' cost of converting coal-burning locomotives and a major — locomotive conversion project was carried out.

The saturation of the prairies could not have been accomplished without a pipe line eastward. As an initial stage and in a time of acute shortage of pipe rolling capacity, plans had been made to start the line eastward as far as Regina. On the basis of a firm order for the maximum diameter pipe that could be rolled at Welland at that time, a new pipe mill was constructed and 16-inch

diameter pipe produced. With the later decision to carry the line to the Great Lakes, this pipe was installed east of Regina as far as the United States border.

Ontario Market

The Interprovincial Pipe Line Company's project to reach the Ontario market was made feasible by Imperial assuming substantial financial obligations. Imperial had to guarantee by throughput and deficiency agreements both the interest and principal on the original debenture and bond issues totalling \$89 millions. In addition, at the specific request of the financing group, Imperial subscribed to one-third of the common shares and convertible debentures originally issued by Interprovincial. Subsequently it contributed the same proportion of the additional funds raised by equity financing in 1953. In all cases, Imperial paid the same price as the public. Imperial's total direct investment amount to \$14.6 millions in addition to the underlying guarantees.

Imperial also built three large lake tankers designed exclusively for this trade. Two were financed by bond issues of \$8 millions guaranteed by Imperial and the other by a cash investment of \$4.2 millions.

In order to promote the use of Alberta crude by other refiners in Ontario, Imperial entered a 5-year contract with British American Oil Company to supply 3 million barrels of Leduc crude oil annually for delivery to its Clarkson refinery. The commitment was required to justify the construction by British American of a large lake tanker to carry the oil from Superior, Wisconsin, to Clarkson and required Imperial's guarantee of crude priced low enough to compete with Illinois crude from Toledo. Imperial also made a 10-year commitment to supply 15,000 barrels per day of Redwater oil to Canadian Oil Companies Limited at a delivered cost competitive with Illinois oil at Sarnia, the main purpose of the contract being to enable Canadian Oil to build a new refinery to use Alberta crude rather than imported crude oil.

In order to curtail the use of imported crude oil purchased from Imperial's affiliates for delivery at Sarnia, it was necessary to construct a large tank farm at Sarnia to accumulate supplies for the closed navigation period. The new tankage and dock facilities at Sarnia cost \$6 millions. Much higher investments for tankage and additional tankers were scheduled when, toward the end of 1952, the rapid growth of crude reserves resulted in a reappraisal of the tanker program. As a result, it was decided to halt the tanker and tankage construction program and, instead, arrange with Interprovincial to extend its line from Superior to Sarnia in order to bridge the water gap on a year round basis.

The growth of the Ontario market and the extent of its supply from Canadian crude are indicated in the following summary:

Crude Oil Runs at Ontario Refineries

(thousands of barrels per day)

	Imports	Canadian	Total
1950 - - - - -	68.7	—	68.7
1951 - - - - -	43.7	30.0	73.7
1952 - - - - -	37.3	47.6	84.9
1953 - - - - -	30.3	73.2	103.5
1954 - - - - -	24.1	97.3	121.4
1955 - - - - -	26.6	107.0	133.6
1956 - - - - -	25.3	131.9	157.2
1957 - - - - -	21.7	137.1	158.8

In addition to cutting Ontario crude imports by 47,000 barrels per day since 1950, the runs of Canadian crude have grown by an additional 90,000 barrels per day due to the installation of

new refinery capacity. Imperial's investment in additions and improvements at its Sarnia refinery since 1950 totals \$51.8 millions exclusive of tanks and docks for crude oil.

The extension in 1951 of the market for Alberta crude to Ontario had important economic significance for western producers and consumers. Once the throughput guarantees were made and the facilities installed, the prairie production was permanently committed to a price that would meet whatever competitive forces were encountered in the Ontario market regardless of more attractive markets that might develop elsewhere.

This basic fact resulted in a prairie crude price structure much lower than would have applied had the market not been extended beyond the prairie provinces. Thus, the Leduc crude price drop on reaching Ontario was 44 cents per barrel.

United States Markets

The construction of the Interprovincial line to the lakehead and its subsequent extension through Michigan, provided an economic basis for extensive selling efforts and negotiations to promote the use of Canadian crude oil along the pipe line route in the United States.

Imperial entered long term supply contracts with Lake Superior Refining Company and International Refineries, as a result of which their respective refineries at Superior, Wisconsin, and Wrenshall, Minnesota, were constructed. Later, as a result of discovery in Saskatchewan of crude oil of a quality not readily marketable in Canada, a pipe line was built by others in the industry from Clearbrook, Minnesota, on the Interprovincial line to supply a new refinery at St. Paul, Minnesota, designed specifically for the use of this type of Saskatchewan oil. The completion of this line made it possible for any grade of Canadian crude carried in the Interprovincial system to be delivered to St. Paul refineries. The growth of the export market in these areas is shown in the following table:

Exports to Central United States Refineries

(thousands of barrels per day)

									Michigan	Lakehead	St. Paul	Total
1951	-	-	-	-	-	-	-	-	....	.9	....	.9
1952	-	-	-	-	-	-	-	-	....	3.1	....	3.1
1953	-	-	-	-	-	-	-	-	....	6.0	....	6.0
1954	-	-	-	-	-	-	-	-	....	3.0	....	3.0
1955	-	-	-	-	-	-	-	-	....	7.3	7.7	15.0
1956	-	-	-	-	-	-	-	-	4.7	15.4	26.7	46.8
1957	-	-	-	-	-	-	-	-	4.5	14.9	37.2	56.6

Pacific Coast Market

Even before the extension of the Interprovincial line to Sarnia, it was recognized that with Alberta oil priced to be competitive with imports in Ontario, there was a sound basis for believing it to be economically attractive to refineries in the B.C. and Puget Sound area. A number of large oil companies interested in such a proposal jointly studied it over a period of several months in 1950-51. At the concluding meeting, considerable reluctance to proceed with such a risky venture was expressed but Imperial decided it would support a pipe line from Edmonton to Vancouver even if none of the other companies were interested.

Subsequently, several other companies agreed to support the venture and Trans Mountain Oil Pipe Line Company proceeded with the line. Imperial subscribed to $8\frac{2}{3}$ percent of the common shares issued, investing \$1.3 millions at the public price. The bulk of the funds to build the line was shared by First Mortgage Bonds secured by deficiency agreements of the few large companies sponsoring the venture. A total of \$65 millions was raised by a bond issue in 1952 of which 54.178 percent was guaranteed by Imperial. Later, borrowings were increased to \$101 millions, of which Imperial's deficiency agreement covers over \$41 millions.

The forecast demand of the British Columbia market was just about sufficient at the originally contemplated tariff of 60 cents per barrel to service the debt incurred to finance the pipe line. For this throughput to materialize, however, required a major expansion and modernization of the industry's three Vancouver refineries to back out the substantial imports of petroleum products needed by the growing market. In Imperial's case the projects at Ioco involved capital expenditures of \$21.4 millions since 1951.

It was hoped, however, that as in the case of the Interprovincial line at the lakehead, the construction of the Trans Mountain system would attract new refinery capacity, this time in the Puget Sound area to take over a portion of the substantial market in the Pacific north west, then supplied by products from California. General Petroleum, Shell and United States Refining Company built refineries there and Texas Company has a new plant under construction.

When the General Petroleum refinery was completed, it was learned that it was to operate in large part on Venezuelan crude. In order to secure a continuing outlet for Alberta crude oil, Imperial negotiated agreements with General Petroleum and Socony Mobil under which Imperial purchases 11,500 barrels per day of Venezuelan crude from Socony for shipment to Montreal or Halifax, and General Petroleum Company buys a like volume of Alberta crude for shipment to Ferndale. This agreement is still in effect.

The outlet to the west coast in early 1957 exceeded all previous forecasts as a result of the disruption of normal transportation routes caused by the closure of the Suez Canal. The reopening of the Canal and distress tanker rates have been equally disturbing in the opposite direction and the current market for Alberta crude on the west coast is depressed. The historic development of this market is illustrated in the following table:

Deliveries of Alberta Crude to West Coast Market

(thousands of barrels per day)

								Vancouver	Puget Sound	Tankers	Offshore	Total
1953	-	-	-	-	-	-	-	7.3	....	....	....	7.3
1954	-	-	-	-	-	-	-	36.3	4.1	....	....	40.4
1955	-	-	-	-	-	-	-	52.7	30.9	....	....	83.6
1956	-	-	-	-	-	-	-	55.9	52.5	17.0	....	125.4
1957	-	-	-	-	-	-	-	61.4	74.2	19.6	....	155.2

PRINCIPLES OF MARKETING DEVELOPMENT AND EXPANSION

The expansion of markets for Canadian crude which we have been discussing illustrates the basic principle that on the competitive battlefield of crude markets the advantage of a given source varies directly with the relative length of the lines of supply of competitive sources compared with the length of its own lines of supply to the market. This means that the price in the fringe market less transportation to the market establishes the price at the wellhead.

Therefore, the incentive for market expansion for western Canadian crude oil, as well as the incentive for exploration and development, depends in substantial measure on the extent to which our transportation network is competitive with those of alternate supply sources. As a simplified method of bringing out the relative advantages and disadvantages of various markets for Canadian crude, it is interesting to review the basic distances involved between supply sources and markets. Individual cases may in practice be modified by the specific transportation facilities available or by short-term variations in items such as tanker rates, but in general the basic conclusions as to the relative attractiveness of various markets will not be affected.

In the interior part of the North American continent the competition which Canadian crude meets is from United States crude oil.

TABLE I
Distance Factors
Internal Continental Crude Oil Markets for Canadian Crude

Market	Distance in Miles from:		Canadian Crude	
	Edmonton	U.S. Mid-Continent* (Drumright, Okla.)	Advantage	Disadvantage
Edmonton - - - - -	.....	1,600	1,600	....
Regina - - - - -	440	1,160	720	....
Lakehead - - - - -	1,100	745	.....	355
Sarnia - - - - -	1,740	890	.....	850
Chicago - - - - -	1,436	620	.....	816
Toledo - - - - -	1,630	785	.....	845

Table I shows the relative distances from representative competitive crude sources in western Canada and the United States to these interior continental markets. The reason for successive price reductions in Canadian crude as the market has expanded farther east is readily apparent from these relative distances. The disadvantage for Canadian crude in the fringe market of Ontario is reflected in the lower price obtained at the well for Canadian crude as compared with competitive United States crude.

When markets accessible to crude oil moved by ocean tanker are considered, a different competitive basis is involved. Here the competition to be met is that of the low cost off-shore crude from Venezuela and the Middle East. (The higher priced United States crude oil no longer represents the competition which must be met in these areas.)

In Table II the equivalent relative distances from these various sources to certain seaboard markets is shown. Since some of the distances are overland and some are by sea, it has been necessary to convert the mileages to equivalent distances for comparison. For equal distances, pipe line transportation via large diameter pipe lines costs two to three times as much as transportation by super tanker. For purposes of this comparison the tanker miles have been divided by the minimum factor of two in expressing the total distances in equivalent pipe line miles.

TABLE II
Equivalent Distance Factors
Seaboard Continental Crude Oil Markets for Canadian Crude

				Distances in Miles		(In Equivalent Pipeline Miles)	
				Pipeline	Tanker	Total Equivalent Pipeline Miles	Canadian Crude Advantage Disadvantage
<i>Puget Sound Market</i>							
From Edmonton -	-	-	-	700	.....	700	.....
Venezuela -	-	-	-	.....	5,000	2,500	1,800
Persian Gulf -	-	-	-	.....	10,800	5,400	4,700
<i>San Francisco Market</i>							
From Edmonton -	-	-	-	700	800	1,100	.....
Venezuela -	-	-	-	.....	4,200	2,100	1,000
Persian Gulf -	-	-	-	.....	11,100	5,550	4,450
<i>Montreal Market</i>							
From Edmonton -	-	-	-	2,300	.....	2,300	.....
Venezuela -	-	-	-	200	2,000	1,200	.....
Persian Gulf -	-	-	-	.....	8,300	4,150	1,850

*United States Mid-Continent taken as representative, since other crudes such as Illinois normally bear a relation in price reflecting the differences in distances involved.

It will be noted that on the west coast Canadian oil has a marked transportation advantage. Middle East crude, however, because of its lower well price remains competitive in these areas. On the eastern seaboard, as exemplified by Montreal, Canadian oil has lost most of its transportation advantage against Middle East crude and is at an actual disadvantage compared with Venezuelan crude. The significance of these figures is that they demonstrate that Canadian crude's competitive position is relatively speaking better by two to three thousand miles on the west coast than at Montreal. In other words, competing against the same crudes, western Canadian oil is much better fitted by basic location to fight for the market on the western rather than the eastern seaboard.

The distance figures in the above tables are merely a simplified manner of bringing out the competitive position of Canadian crude in certain markets and the reason why it is generally accepted that the interior continental and west coast markets are preferred outlets for Canadian crude oil as compared to the Montreal market.

How these considerations and the several programs of expansion which have resulted from them have worked out in practice is illustrated in the insert charts which follow. Chart 1 summarizes the build-up over the years since the discovery of Leduc of the various segments accounting for the total Canadian crude market. Chart 2 shows a further breakdown of the data for the past few years so as to bring out the quarterly variations from the annual averages.

CANADIAN CRUDE PRODUCTION & CONSUMPTION

THOUSAND BARRELS PER DAY

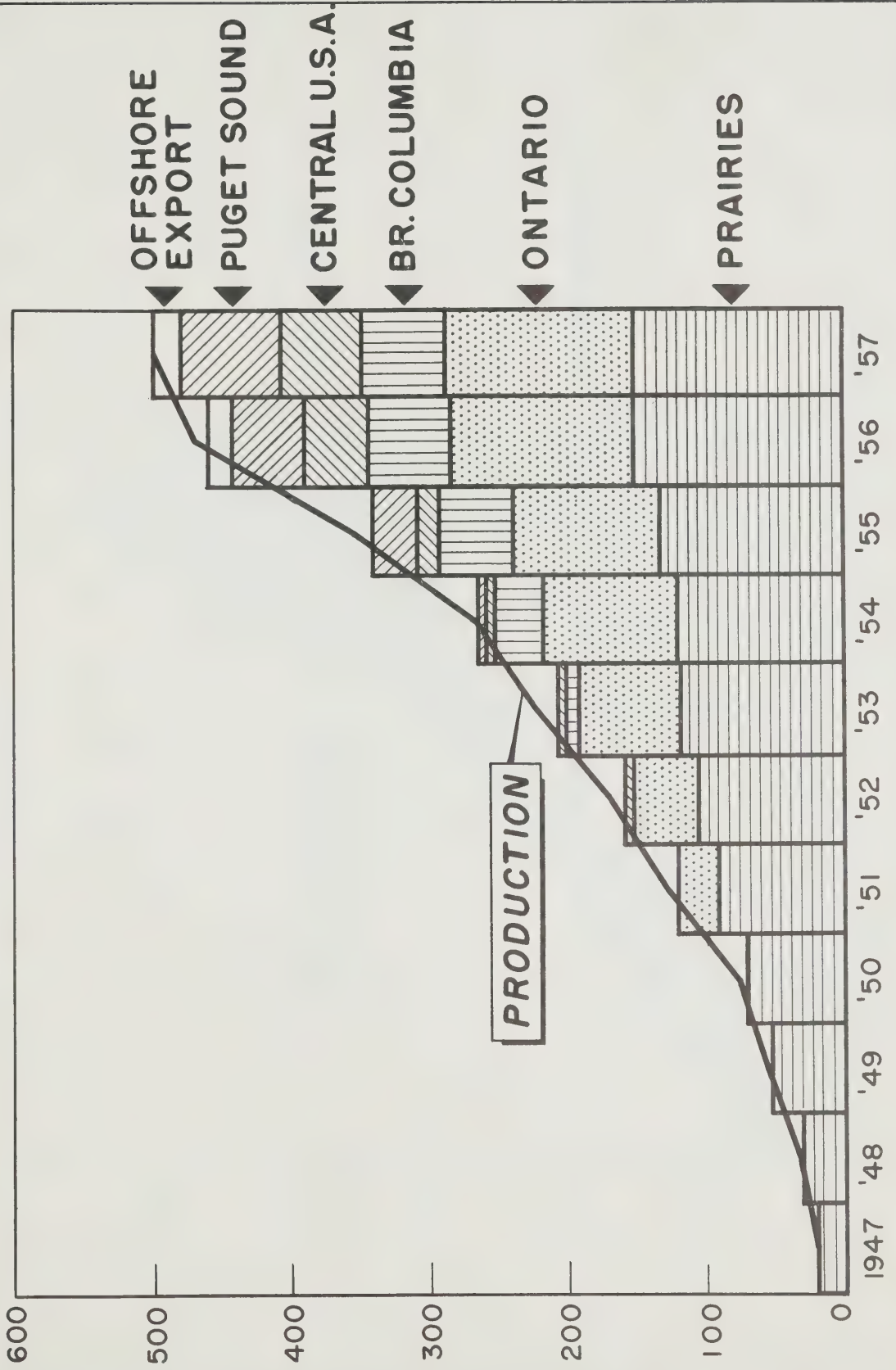


CHART I

CANADIAN CRUDE PRODUCTION & CONSUMPTION

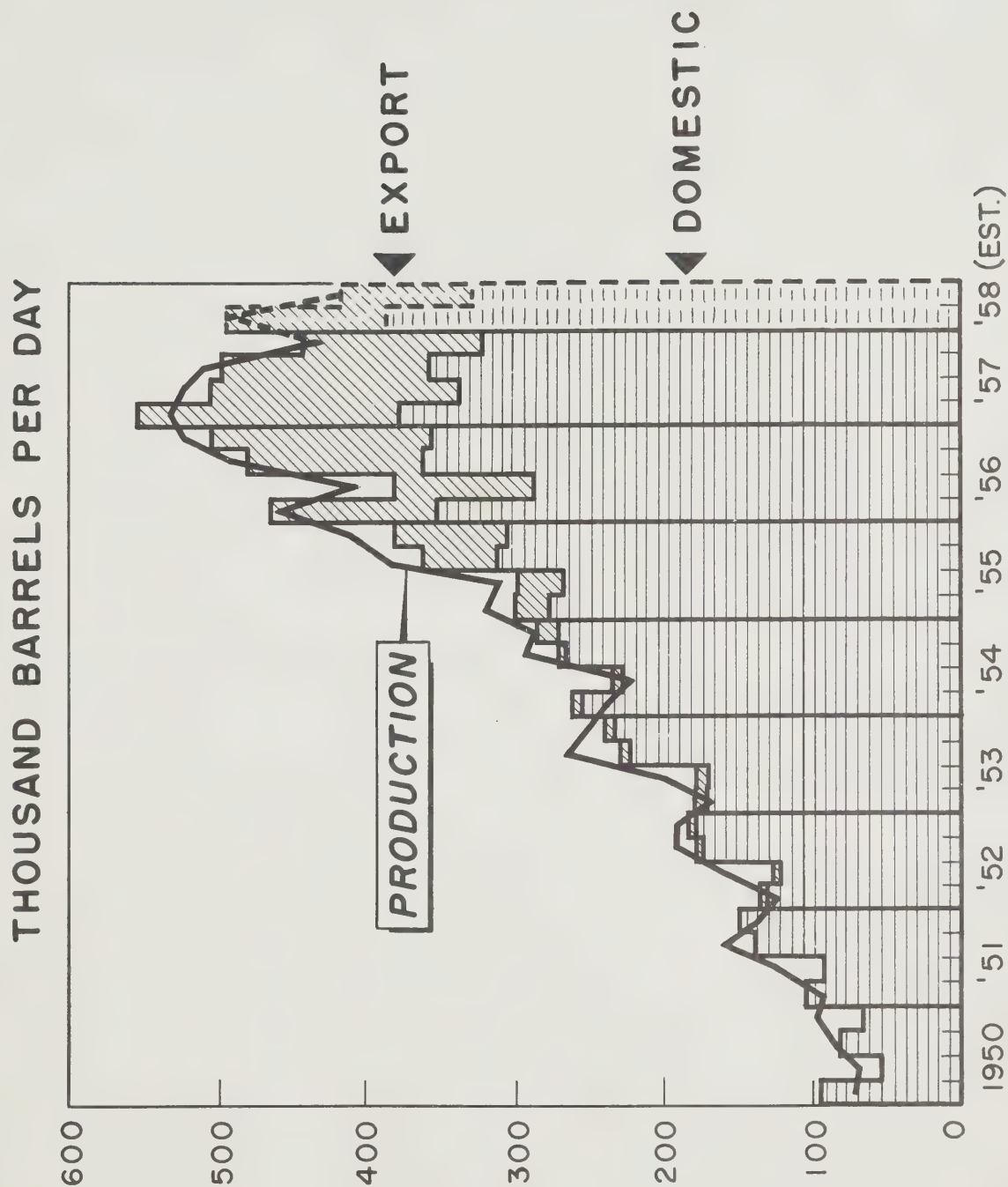


CHART 2

V. THE CURRENT DECLINE IN CRUDE OIL MARKET

During 1957 production of crude petroleum in Canada suffered an interruption of its long term growth trend. This trend, which showed substantial year-to-year production increases since the discovery at Leduc in 1947, and registered a 6 percent increase for 1957 over the previous year, had turned downward by the third quarter of last year. Indications are that these lower producing rates are continuing in the early months of 1958. There are a number of reasons for this current slump.

Petroleum today supplies approximately 50 percent of Canada's energy needs. It provides the motive power for three-quarters of our entire transportation facilities, fuel for about 40 percent of our residential and commercial heating and a similar percentage of the total energy required for industrial and other purposes. With the increasing use of petroleum in our economy it is natural that cyclical business trends influence the demand for petroleum products. Thus the downward adjustment in Canadian business activity, which began in the summer of 1957, was reflected in petroleum requirements.

Petroleum was not alone in this decline. An analysis of various business indicators reveals a similar, and in some cases a more pronounced, decline in economic activity.

Business Indicators, By Quarters
Percentage Increase or Decrease, 1957 — Over Similar Periods — 1956

	1st Quar.	2nd Quar.	3rd Quar.	4th Quar.
Index of Ind. Prod. - - - -	+4.9	+1.5	—1.5	—4.9
Durable Goods - - - -	+4.8	—4.1	—8.0	—10.3
Steel - - - -	+7.2	—2.0	—4.7	—19.9
Railway (Carloadings) - - -	—5.6	—9.9	—8.3	—9.2
Motor Vehicles - - - -	+18.9	—19.4	—18.5	—29.6
Newsprint - - - -	+3.8	+3.4	—1.3	—10.1
Lumber - - - -	—14.1	—6.0	—13.8	—15.3
Crude Production - - - -	+15.0	+27.8	+3.3	—16.7

These recessionary influences affected in some degree the demand for petroleum products and in turn production of petroleum in Canada during the latter part of 1957.

Secondly, it became clear late in 1957 that petroleum product inventories had reached an unsatisfactorily high level. Inventories maintained a satisfactory relationship with product demand during 1955 and the first half of 1956. However, during the last half of that year product inventories increased more sharply than demand. This state of higher than normal inventories in relation to demand continued through much of 1957. When it became apparent that demand was declining, liquidation of surplus inventories became a necessity. This reduction of inventories was reflected in lower crude running at refineries and lower crude petroleum requirements. An analysis of this problem indicates a continuation of inventory liquidation during the early months of 1958. However, once this has been accomplished to the satisfaction of the individual refiner, refinery runs will again bear a more direct relationship to product demand.

Weather has a direct influence on the demand for Canadian crude. In recent years there has been a sharp shift to automatic heating with oil in Canada. Oil has provided the source of heat for virtually all of this growth because of the unavailability of gas in many metropolitan areas. Heating oil demand is related to the weather, to new housing construction, and to the conversion to oil from other fuels. During 1957 the weather in Canada was 6 percent warmer than the year previous and 4 percent warmer than normal. More important, in the heating season September, 1957 through March, 1958, the weather was 5.6 percent warmer than last year and 8.1 percent warmer than normal. This warmer weather had an unfavorable influence on the demand for Canadian crude.

With the introduction of natural gas in many of our metropolitan centres oil is now facing new competition in the home heating and industrial markets.

These then are the principal domestic factors which have influenced the demand for crude petroleum in Canada during the past few months. To a large extent they are beyond the control of the petroleum industry.

There is one additional factor that is affecting the demand for petroleum during this Spring. Refineries require periodic shut-downs for maintenance inspection and repair, to provide continuing efficient and safe operation. These periods are called "refinery turnarounds" and usually occur every 12 to 18 months. They last about a month to six weeks. During these turnarounds no crude oil is processed and thus the purchasing of crude oil is reduced. The indicated scheduling of refinery turnarounds in many areas of Canada this Spring will adversely affect crude production. However, this could speed inventory corrections, so that subsequent crude processing would offset this temporary decline.

Some of the factors which affected the domestic demand for Canadian crude also affected the external markets for Canadian crude in the mid-west and Pacific north west area of the United States. The business recession in the United States reduced petroleum product requirements to the extent that there was no growth in United States domestic demand last year. Inventories which had been carried in anticipation of a continuing high market demand suddenly became excessive, necessitating liquidation. The inventory problem was further complicated by excessive stocks which had been built up in many areas during and after the Suez crisis.

As soon as the Suez crisis was settled, normal supply lines were restored but before supplies could be fully adjusted United States Gulf coast refiners were left with excessive inventories of product. Warmer weather in the winter season of 1956/57 in the eastern United States further added to the problem. With a reduced demand in that country, high inventories continued and United States crude production declined. The sharp drop in ocean tanker rates which followed Suez made it possible for low cost foreign crude to move in increasing quantities into United States coastal markets and replace to some degree United States crudes, thereby further shutting in United States production. The combination of these factors resulted in the establishment of voluntary import quotas on foreign crude moving into the United States, first into the eastern part of the country and later into the west coast. The same inventory and market factors which led to the establishment of crude import quotas in the United States have contributed to a decline in the current Canadian crude requirements of United States refiners. Because of these overriding market considerations, demand for Canadian crude has so far been insufficient to be limited by import quotas.

During the Suez crisis Canadian crude production was temporarily inflated by the movement of Canadian crude to the California market. This was made economic by the shortage of ocean tankers at that time and the resultant high tanker rates. When the Suez crisis was settled ocean freight rates declined sharply and, coupled with surplus low cost foreign crude, made Canadian crude no longer attractive to refiners in the California market.

Thus the decline in Canadian crude production during the latter part of 1957 and early 1958 was due to a number of factors many of which were prevalent worldwide.

It was not, as some have suggested, due to increasing imports of foreign crude petroleum and products into Canada in 1957. Crude imports into eastern Canada totalled 306,000 barrels per day last year, an increase of 14,000 barrels per day over the previous year, or approximately 5 percent. This was about equivalent to the total increase in domestic demand for petroleum products during the year and was due in some degree to increased crude requirements for the expanded Halifax refinery to replace product imports. Thus, this increase was offset to some extent by a decline in product imports of 4,000 barrels per day during 1957, to a level of 95,000 barrels per day. Some of

these product imports are necessary for two reasons. They are required to supply products of a kind not manufactured in Canada. Secondly, since heating oil demand in relation to gasoline demand is greater in some areas than can be produced from crude processing, it is necessary in these areas to import middle distillates and heavy fuels.

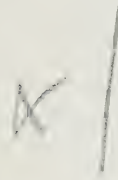
In summary, an unfortunate combination of circumstances, all acting in the same direction, have brought the current production of Canadian crude to an abnormally low level. Many of these factors are not basic but cyclical and random in nature, and thus temporary in their effect.

VI. FUTURE MARKET ALTERNATIVES

While the explanation of the current slump in western Canadian crude production may be interesting, it is to the future we should turn our attention. In considering alternate routes which might be followed for future Canadian crude markets, it should be recognized that in such a fluid and rapidly changing industry no course is without its risks and uncertainties. However, there are certain tests which a satisfactory proposal should meet so far as possible:

- (a) Preserve a reasonable incentive for exploration.
- (b) Preserve flexibility to secure the economically most advantageous markets in the long run.
- (c) Avoid imposing long term disadvantages on particular sectors of the economy or the consumer.
- (d) Avoid insofar as possible artificial supports or controls which could tend to undue increase or rigidity in government controls.

With such tests in mind, we should like to consider three alternative approaches to the future market problem:*

- 
1. A minimum or "do nothing" approach.
 2. A maximum or "all out" method involving construction of major pipe line facilities to Montreal.
 3. An intermediate route involving positive efforts, short of a pipe line to Montreal.

Minimum Case

The first of these routes can be dealt with very briefly. What is involved here may be summed up as awaiting the end of the current cyclical dip and depending thereafter on normal growth in the markets already supplied with Canadian crude. Assuming the business recession will have run its course in 1958 we believe that a reasonable estimate of the demand for Canadian crude in this case would be approximately as follows:

					Domestic	Export	Total
1957	-	-	-	-	350,000	150,000	500,000 barrels per day
1958	-	-	-	-	370,000	94,000	464,000
1959	-	-	-	-	409,000	125,000	534,000
1960	-	-	-	-	434,000	146,000	580,000
1961	-	-	-	-	463,000	163,000	626,000
1962	-	-	-	-	492,000	180,000	672,000

The domestic requirements are assumed to return to the normal trend growth, with the increases in domestic demand from British Columbia to Ontario covered with Canadian crude. The export estimates assume that with return to normal demand, United States refiners using Canadian crude will fully utilize their import quotas and that these quotas will be adjusted thereafter to meet the normal growth in United States market demand.

*Our estimates of possible market volumes under these several cases cover the coming critical five years only, since the long run adequacy of markets is little questioned.

While the above estimated requirements represent an appreciable improvement on the present depressed condition, they do not increase as rapidly as would appear desirable, particularly in the early part of the period.

The Montreal Case

From the standpoint of volume of market outlet for Canadian crude, the advantages of supplying the Montreal market are obvious. Assuming that the major pipe line construction to supply Montreal would be in operation in 1961, it is estimated that the market for Canadian crude might be about as follows:

		Domestic	Export (barrels per day)	Total
1957	- - - - -	350,000	150,000	500,000
1958	- - - - -	370,000	94,000	464,000
1959	- - - - -	409,000	125,000	534,000
1960	- - - - -	434,000	146,000	580,000
1961	- - - - -	736,000	113,000	849,000
1962	- - - - -	776,000	130,000	906,000

In other words, in 1961 and 1962 there would be a net increase over the "minimum" case previously discussed as follows:

	1961	1962
Increase in eastern Canada		
Montreal - - - - -	252,000	263,000
Ontario - - - - -	21,000	21,000
Decrease in west coast export - - -	—50,000	—50,000
Net Increase - - - - -	<u>223,000</u>	<u>234,000</u>

The Ontario and Montreal refineries would be fully covered with Canadian crude except for a small volume of "specialty" type and balancing foreign crude. However, throwing large volumes of foreign crude back on the world market would undoubtedly create strong pressures to find a home for this oil elsewhere with the result that Canadian crude oil's position in the west coast export market could be seriously undermined. In other words, the necessity of securing outlet would undoubtedly force some of this displaced crude oil into Puget Sound. Therefore, the above estimates allow for the loss of a major portion of the United States Puget Sound market in 1961 and 1962.

Placing the Montreal market on Canadian crude oil would raise difficult problems, fundamentally economic and long-range in nature. What the precise competitive position of Canadian crude vis-a-vis Venezuelan or Middle East crude might be at the time of the completion of pipe line facilities or at various times thereafter is impossible to predict. Perhaps the best that can be done is to consider relative prices as they exist today and speculate with respect to what future trends may bring.

The positions of the several individual Montreal refiners in utilizing Canadian crude would undoubtedly vary. However, we estimate that if today there were a large efficient pipe line from western Canada to Montreal the disadvantage to Imperial Oil Limited's refinery in utilizing Canadian versus imported crude would be at least 25 cents per barrel as shown in the table following.

Comparison of Current Price for Imported Crude with Theoretical Price for Canadian Crude at Montreal

Redwater Crude — 35° Guanipa Crude — 31°

(a) *Charges in U.S. \$*

F.O.B. posted price - - - - -	2.800
Tanker rate (USMC — 45%) - - - - -	.226
Outturn and terminalling - - - - -	.035
Pipeline allowance - - - - -	.015
Pipeline tariff — U.S. funds portion - - - - -	0.270
	<hr/>
Subtotal — U.S. funds - - - - -	0.270
Canadian equivalent @ \$1 U.S. = \$0.97 Canadian -	0.262
	<hr/>
	3.136
	3.042

(b) *Charges in Canadian \$*

Wellhead - - - - -	2.560
Gathering and other charges to Edmonton - - - - -	.083
Pipeline allowance - - - - -	.026
Pipeline tariff — Edmonton to Montreal —	
Canadian funds portion - - - - -	.330
	<hr/>
Subtotal - - - - -	2.999
	<hr/>
Total equivalent Canadian \$ - - - - -	3.261
Adjust to equivalent quality - - - - -	.....
Add charge for idle Portland/Montreal Pipeline and terminal -	.07
Add interest on added inventory in transit - - - - -	.01
	<hr/>
Comparative Net Costs - - - - -	3.34
	<hr/>
	3.07

The major concern, however, centers on the strong probability that the disadvantage might widen markedly during the 30-year period required to depreciate the pipe line. Aside from the fact that the foreign crude price situation is shaky today, the longer term concern stems from certain basic factors of competitive disadvantage.

1. First of these is the size of foreign crude oil reserves already proved (no additional finding cost required). Proved reserves outside continental North America and the Soviet area today stand at 198.5 billion barrels, equivalent to 73 times last year's rate of production. By comparison Canadian proved reserves of 2.75 billion barrels are equivalent to 15 times 1957 production. Future increases in finding costs are likely, therefore, to affect Canadian costs more than those in the prolific foreign areas. (For purposes of comparison, United States proved reserves of 33.5 billion barrels were 13 times 1957 production.)
2. Development and lifting costs are comparatively very low in many foreign areas due to the high productivity of individual wells. Canadian wells at full efficient productive rates average about 77 barrels per day per well. However, the Venezuelan average is about 250 barrels per day per well and that in the Middle East a striking 4,400 barrels per day per well. (Again for comparison, United States wells at full efficient rates average about 17 barrels per day per well.)
3. Because of his lower costs the foreign producer generally starts today with a relatively wider profit margin available for competitive action. In addition, his

incentive to sell his own production is greater than that of the pro-rated producer who must purchase a considerable number of barrels from others for each additional barrel of his own production.

With the basic economic disadvantages to Canadian crude oil in the Montreal market, the question must, therefore, be asked as to who will pay the bill to make it (and more importantly — keep it) competitive in price with imports into Montreal. Let us consider the problems of the producer, the refiner and the pipeliner.

Problems of the Producer

Under normal circumstances, the producer, who stands to gain additional market outlet, would assume the cost involved in lowering his price to meet that of the competition. His ability and interest in doing so would, of course, vary directly with the percentage increase in net outlet which he would secure and inversely with the percentage reductions in price and per barrel profits which he would have to assume. In committing himself to a long-term reduction in price he would be writing down to this extent the value of his existing and future reserves. On the other hand, from a present worth standpoint there would be the advantage of earlier realization on such reserves. In determining whether the price reduction would in the long run be worthwhile, careful consideration would have to be given to factors such as future replacement costs and to the tendency over the years for the proposed Montreal outlet to represent a declining factor in the total expanded Canadian crude outlet of the future.

The impact of price versus volume on individual producers in western Canada will vary greatly since the extent to which added market means added production varies widely. Based on the current situation, volume of production in Saskatchewan and Manitoba fields would be little affected since where quality permits they are normally allowed to produce at potential. For Alberta, a study we have made of February, 1958, data indicates the following:

	Fields	Wells
Fields on economic allowance and on total MPR - - -	70	2,377 2292
Fields being prorated - - - - -	52	4,943 5128
	<hr/> 122	<hr/> 7,320

The 52 prorated fields would gain volume from new market penetration but more than 95 percent of the increased volume would come from 14 of these fields. This concentration of shut-in capacity in a relatively few fields would result in relatively few companies securing most of any increased production. Our February study would indicate that at that time some 95 percent of any increase in volume of production would accrue to 28 of the approximately 220 companies owning production in western Canada. From these figures it may, therefore, be concluded that any price reduction would represent a net loss to many producers, and that to a much smaller number revenue from increased volume would compensate in markedly varying degrees. At this point, it seems worth repeating that the Canadian producer is already realizing a price at the wellhead appreciably less than other Western Hemisphere crudes and any substantial sacrifice in such realization would take away the exploration incentive.

The total volume of oil committed to the Montreal market over the 30-year life of a pipe line would be roughly equal to the total of today's proved reserves. With a reasonable prospect that over the years nearer and more attractive markets for western Canadian oil would sharply increase, there would appear to be a grave risk in being committed to a more distant market regardless of the price it might bring to the total production.

Thus, in general, it would not appear that the producer could afford to take an open-end commitment for himself or future new producers to supply the Montreal market for 30 years at the risk of whatever lower price might be required to be competitive in that market.

Problems of the Refiner

The cost of crude oil represents the Montreal refiner's major item of expense. He cannot, therefore, sacrifice the flexibility of competitive sources of supply and risk a long term commitment without assurance of price protection to the extent needed against competitive sources of crude oil or refined products.

As a basic corollary of our competitive system, a refiner confronted with added costs has but two alternatives:

1. Recoup such added costs in the long run in higher prices than would otherwise prevail.
2. Fail to recover his fixed charges and gradually go out of business if other refiners or product importers have lower costs permitting them to set lower competitive prices.

Suggestions have been made that Montreal refiners might absorb a higher cost of Canadian crude oil up to the extent of the existing duty protection on refined products. In order to foster secondary industry, the present duty structure provides the Canadian refiner with duty protection equivalent to roughly $\frac{1}{2}$ cent per gallon of crude. It should be recognized that:

1. There are a number of factors generally characteristic of the Canadian petroleum refining industry which add to its costs compared to those of refiners in other countries supplying products for import. These include:
 - (a) Somewhat higher capital costs. These reflect such factors as winterized design and winter construction, duty protection on Canadian materials, added freight on other materials, etc.
 - (b) Higher fuel costs for refinery operation.
 - (c) Generally smaller size with resultant higher unit costs, despite slightly lower labour rates. Even the largest Canadian refineries represent a multiplication of smaller units added as business has grown rather than single large units.
 - (d) Additional costs of redistribution. Refined products can be imported direct to major distribution points within a broad refining area. The Canadian refiner must absorb the cost of trans-shipping to such points.
 - (e) Because the sales tax does not apply on the transportation portion of a laid-down price, the sales tax levied on Canadian refined products is slightly higher than on imported products.
 - (f) On the average, tanker rates on "dirty" products and crude oil tend to be slightly lower than for "clean" products. This is offset, however, in the case of an importer of products into Canada by his ability to average lower seasonal tanker rates during his import season than the year-around average.
 - (g) The product importer into Canada in general secures his products at the seasonal low price of the exporting refinery rather than at the average price realized by such refinery.
2. Prices of imported products represent a ceiling to the Canadian refiner but not necessarily a floor. It is, of course, obvious that any duty structure must be national in scope. However, in any case where full duty protection may not be required, competition of the Canadian refineries within such area will tend to eliminate imports of some products by setting the price level below the cost laid down of imports. Statistics show that the importation of gasoline, the refiner's principal product, has for practical purposes been eliminated from the Montreal area.

Consideration of the above factors leads to the conclusion that unless sooner or later the refining industry is to be liquidated, the price paid by the customer in the Montreal area will over the years increase or decrease with the cost of crude oil to the refiner.

It is difficult to see how a Montreal refiner can justify guaranteeing the throughput of a pipe line which would establish a floor on his cost of crude oil. This is particularly true here, because the crude oil in question is at a basic competitive disadvantage with other sources of supply and offers no hope of future reductions in his cost.

Problems of the Pipeliner

As a characteristic of pipe line transportation, coverage of the fixed and capital charges represents a large portion of the tariff charged. The pipeliner must, therefore, assure himself and his source of capital of a continuing revenue at a level high enough to be commercially attractive. Thus, he cannot serve as a buffer between the producer and refiner to equalize changing market relations through fluctuating pipe line tariffs.

As will be more fully developed later, oil pipe lines are not and should not be considered to be in the same category as public utilities. Hence, returns which might be satisfactory for the low risk assured return utility monopoly are unlikely to be commercially attractive to the high risk competitive oil pipe line.

In view of the evident economic risks in building a large pipe line to Montreal, it appears clear that the financing of such a line would require some form of guarantees beyond those which the pipe line company itself could provide.

The normal procedure would be to secure throughput or deficiency agreements from the refiners or producers. For the reasons we have previously discussed, it would appear improbable that these groups would wish to assume the open end risks involved in such a long term commitment.

Under these circumstances some form of government guarantee would seem to be the only alternative. (A guarantee, incidentally, which would put another pipe line — Portland/Montreal — out of business.) The government might, for example, enunciate a policy of protection for the Montreal market and establish the necessary detailed machinery to place it in effect upon completion of the pipe line. However, there are risks that changing conditions might:

- (a) make such machinery inadequate or obsolete,
- (b) direct Canadian crude from Montreal to more attractive nearer markets,
- (c) cause policy of future governments to change.

Under these circumstances, it appears doubtful that a simple provision for a protected market would give sufficient permanency to raise the necessary funds.

The government could, of course, provide a direct guarantee of the pipe line bonds. If this course were followed and the government underwrote the major risk, it is worth asking whether public sentiment would permit private ownership of the line or whether another link toward government control of the industry would be forged.

Mechanics of Control

- There are a number of methods that might be applied by the government to provide protection for the Montreal movement. However, they all present problems either in their administration or in their implications for the future freedom of the industry or both.

- A — *Subventions* — Perhaps the most direct and forthright approach would be through the application of subventions to cover the difference in laid-down cost of the crude at Montreal. Determination of the proper figure and its variation with market conditions

would be difficult, and there would obviously be legitimate government interest in the wellhead price established for Canadian crudes. Finally, it would be an understatement to say that this approach would lack appeal to the general taxpayer and voter.

- but is* B — *A voluntary quota* approach has been suggested, perhaps by analogy with the current involved efforts in the United States. Such a system is capable of dealing with marginal or temporary situations, not suited to provide a permanent solution to the complex Montreal problem. In the case of a Montreal pipe line once installed we are dealing with a permanent situation which would require a permanent protection.

The impracticability of voluntary quotas in the long run lies in the inevitable inequities involved. Those who conform do so at a competitive disadvantage with those who do not. The Montreal refiner could not long justify compliance if other refiners or product importers in all of eastern Canada did not do likewise. Full compliance by all would be tantamount to mandatory quotas.

- C — *Mandatory quotas* could provide the necessary protection. They would, however, have to be comprehensive and complicated. They could not be limited to crude oil for the Montreal refineries. As previously developed, it would be necessary to place quotas on most refined products as well as crude oil to prevent imports of products from lower priced foreign crude from gradually liquidating the Montreal refinery operations. Similarly quotas on imports into the Maritimes would be needed to prevent increased running of foreign crudes in that area with shipment of products into Quebec.

7. Thus it would, in fact, be necessary to erect a protective fence completely around the country. Establishment of the proper quotas would tend to freeze company positions and in any event would lead the government into the awkward position of fully controlling the oil supply and demand with frequent adjustments to maintain the proper balance.

- D — *Import duties* would in many ways be the simplest approach. These would, of course, have to be nation-wide in their application. Also any crude duty would for reasons previously discussed have to be reflected in equivalent increases in duties on refined products imports if the important secondary refining industry is to be maintained.

Administratively a difficult problem is imposed in establishing duties at the proper level so as to exclude the proper amount of imports while minimizing as far as possible the added cost to the consumer. Trial and error methods of establishing the proper level would be complicated by rapid changes in petroleum market conditions.

In summarizing the problem of protection for the Montreal market, two principal end results are indicated:

8. /
1. Higher cost to eastern consumers (or to the taxpayer).
2. An alarming degree of necessary government control with the corresponding threat to the freedom which has contributed so much to the development of the Canadian oil industry.

An Intermediate Case

In view of the inflexibilities of enforced crude movement to Montreal, it would appear worthwhile considering what alternative constructive steps might be taken to improve the market volume for Canadian crude oil.

(a) *The Ontario market.* The largest single market for petroleum products in Canada is that in Ontario. Today the largest portion of that market is supplied with products from refining of

Canadian crude oil. In addition, however, sizeable volumes of products are supplied by direct imports, by shipment from Montreal refineries, and by limited volumes of imported crude oil refined in Ontario.

From the standpoint of simple geography, it is apparent that Ontario is a more economic market for Canadian crude than is Quebec. There would appear to be reasonable statistical possibilities of using pipe line capacity and Ontario refinery capacity already in existence or capable of early completion to increase Canadian crude utilization by up to about 75,000 - 80,000 barrels per day. Each supplier's situation is, of course, different and we can speak only for Imperial Oil. However, for our part, we have been meeting and plan to continue to meet essentially our full Ontario marketing requirements with products from Canadian crude. We are currently expanding our Sarnia refinery capacity by 20 percent. We are also increasing refinery yields of furnace fuel in the hope of selling competitively to those importers who traditionally shop for such products in world markets during the summer.

Canadian crude is already committed to the Ontario market, supported by large capital investments in transportation and refining equipment. In order to penetrate this market, as previously noted, a severe reduction in the wellhead price of crude oil was necessary to make Canadian crude competitive with alternative sources of supply.

Accordingly, it is our view that the first and most important job is to saturate and to secure this Ontario market before undertaking any new obligations and facing the more severe competitive pressures of the Montreal market.

(b) *Puget Sound*. Another market where a higher degree of saturation is worth seeking is the Puget Sound area of the United States. For the immediate short term future the heavily overstocked inventory position of the United States west coast precludes large increases in this direction. However, when the statistical position returns to normal there would appear to be room for marked improvement, even under the existing United States import quota limitations. Total quotas available to west coast importers can be expected to continue to exceed those required for full operation of the Puget Sound refineries. From our earlier discussion, we have also seen that the combination of Canadian crude in Puget Sound and foreign crude in Montreal is economically much more attractive than the reverse combination of Canadian crude in Montreal and foreign crude in Puget Sound. These considerations would appear to set the stage for possible purchases and sales where Canadian crude would be sold to Puget Sound refineries and the foreign crude which might otherwise be sold to that area would be purchased for Montreal. For example in our own case, as was stated earlier, for many months Imperial Oil has been refining at Montreal 11,500 barrels per day of Venezuelan crude purchased from a non-affiliated company and has been selling similar volumes of Canadian crude into the United States Puget Sound.

It is of interest to estimate what the volume of Canadian crude outlet may be if a high degree of saturation of the Ontario and Puget Sound markets is successfully achieved. Our studied estimates for this case are as follows:

		Domestic	Export	Total
1957	- - - -	350,000	150,000	500,000 barrels per day
1958	- - - -	370,000	94,000	464,000
1959	- - - -	489,000	135,000	624,000
1960	- - - -	513,000	171,000	684,000
1961	- - - -	538,000	193,000	731,000
1962	- - - -	567,000	245,000	812,000

These figures represent a net increase in market compared to the "minimum case" previously considered of 90,000 to 140,000 barrels per day beginning in 1959. Compared to the all out Montreal case they represent quicker action with a marked improvement in 1959-1960. In 1961-1962 they are about 110,000 barrels per day lower than the all out Montreal case.

What then might be the producer's situation under this intermediate case? He would obviously benefit from the improved market during the earlier years when improved crude is especially important. Let us consider what the prospects might be for maintaining finding effort and activity at a tolerable level.

In this connection the chart on following page has been prepared showing Canadian crude oil producing potential, production, and the percentage relation of production to potential. The solid lines represent actual history while the dotted lines represent our estimates of future potential as discussed earlier and our estimates of production under the "intermediate" market case just presented. It will be seen that in the past ten years, during a period of aggressive activity, the production has varied over the range of 50 to 70 percent of the potential, reaching a high of 71 percent in 1953-1954. This would appear to be an indication that the industry traditionally develops potential production well in advance of possible market outlet.

The estimates on the dotted portion of the chart indicate that after the present cyclical downturn, production in this case would again fall in the range of 50 - 70 percent of potential. There is, therefore, nothing in these percentage figures in themselves which would justify the conclusion that a tolerable level of activity would not be sustained over the next few years.

There is, of course, the current depressed condition of the market today, which probably will result in some lessening in exploratory activity during this year. However, for the first quarter of 1958, exploration drilling pace did not show any reduction. Seismic surveying showed some decline (after due allowance for normal seasonal shifts), but the decline in this activity has been a distinct trend ever since 1952. Thus, it would appear from the current exploration work indices that the current market slump has not yet reduced the industry activity in exploration. As discussed in Appendix B, this is probably due to the momentum inherent in exploration programs.

Development drilling activity has declined in recent months. Perhaps the most important reason for this is that there are not as many undeveloped proved locations available now as there were a year ago when Pembina and Souris Valley development drilling was at a high level.

Additional factors affecting the rate of drilling may be the declining allowables and the trend toward wider spacing of wells. This variation in rate of drilling is undoubtedly of concern to the drilling contractors. However, it is characteristic of the industry, both in Canada and the United States, and presumably will continue to occur from time to time regardless of level of production. It is not felt that these fluctuations have the same serious consequences as a prolonged cutback in exploration effort.

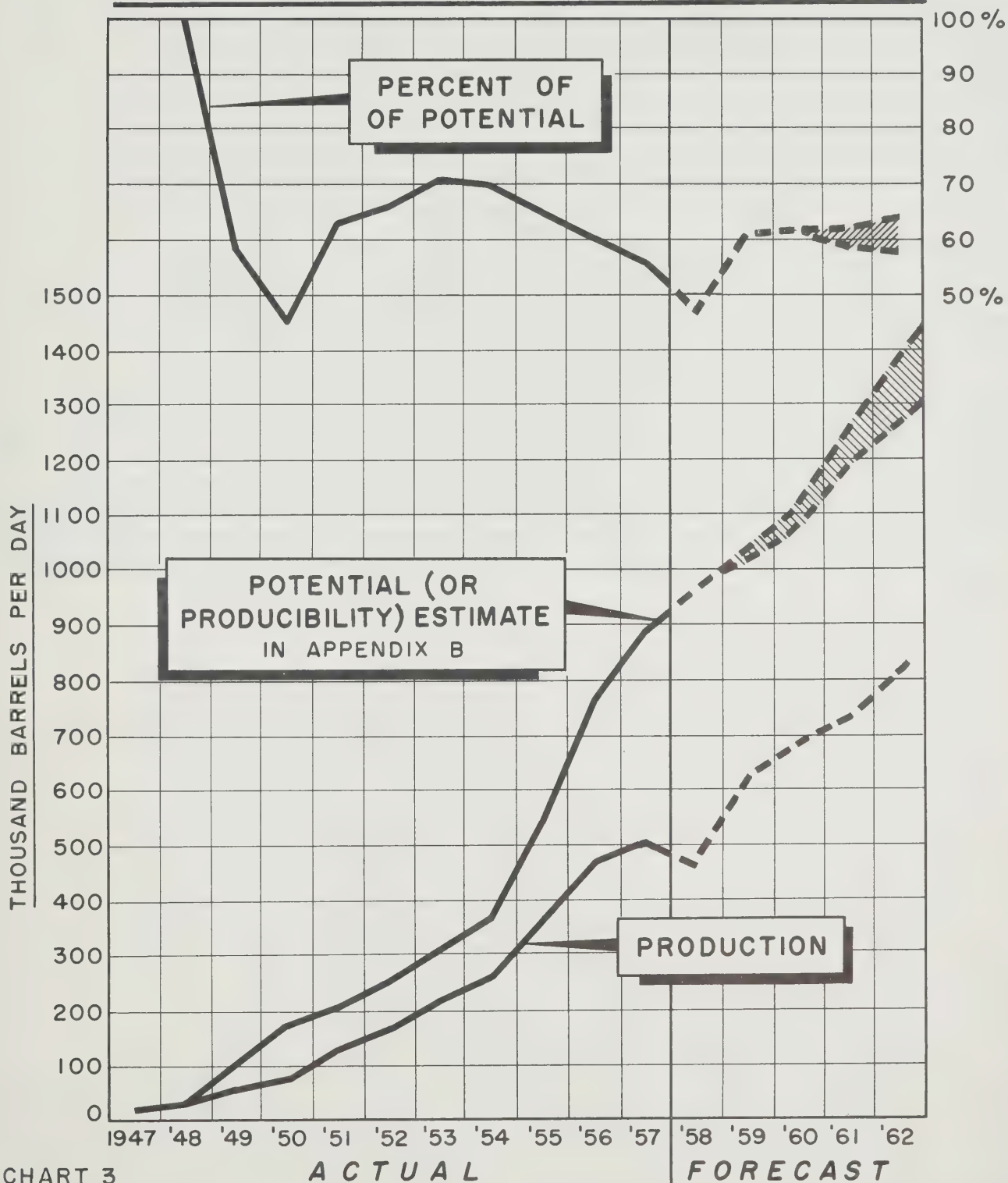
Another line of conjecture that might be followed in judging whether western Canadian producing activity can follow tolerable levels in the next few years is to consider the trends in prospective revenue likely to accrue to the industry. Imperial has studied the historical relationship between the industry's revenues and expenditures and has attempted a rough projection of cash flow into the future in order to assess the industry's ability to maintain a high level of expenditure. Our studies would indicate that even if the high rate of 1957 expenditures are maintained, improved income from gas sales and from attainment of the "intermediate case" market for crude oil would rapidly reduce the size of the annual cash deficits compared to those the industry experienced in recent years.

Exports to the United States

The status of Canadian exports to the United States is today at a low ebb. There are a number of reasons to believe that a more favorable position should develop in the future:

1. The circumstances surrounding the present tightened United States import restrictions appear to reflect in part increased protectionism fostered by the current business downturn. Also it is reported in the press that the limitations on oil

WESTERN CANADA CRUDE OIL PRODUCTION AS A PERCENT OF POTENTIAL



been imports have been adopted partly in an effort to secure passage of the Reciprocal Trades Act Extension with its policy of generally more liberal trade. The oil limitations have apparently framed in a purposely flexible administrative form permitting ready alteration with changed circumstances.

2. Under normal circumstances, the logic of special treatment for Canadian oil is extremely convincing both on a security and trade basis. In fact, under such normal circumstances, Canadian oil was given an exempt status. Even under present provisions allocations have been made in a manner which minimizes the immediate direct impact on Canadian oil. Undesirable as they are in principle and precedent, the present import restrictions have as yet been from a practical standpoint largely a matter of form rather than of substance. This is because the business recession and over-stocked inventory positions have tended to hold the level of movements of Canadian oil below the quota figures.
3. Looking to the longer term future, it is widely accepted that large increases in oil imports into the United States can be expected. With 55 percent of the free world's demand for petroleum and only 14 percent of its proved reserves, the basis for increasing United States imports is evident. Deficiency areas in the northern and western parts of the United States should, therefore, provide in the future economic markets for the tributary Canadian crude oil supplies.

Full efforts should, therefore, be continued to obtain free access to U.S. markets for Canadian

oil.

To conclude our comments with respect to the problem of crude oil markets, it is our judgment that weighing all factors as they appear today, the prospective advantages would not as yet warrant the risks of going to Montreal. We would recommend that first priority be given to trying to develop to the maximum the intermediate case as described in this submission.

VII. OIL PIPE LINE FINANCING AND REGULATION

In considering questions of pipe line financing and regulation, a clear distinction must be made between the "gas" pipe line and the "oil" pipe line. The trunk gas pipe line is a monopoly which purchases, transmits and sells gas (a usable finished product) on long-term contracts. Continuity of operations is thus secured by long-range commitments of supplies and sales extending perhaps for 20-25 years. Also, the sole transportation medium for gas is the pipe line.

On the other hand, the oil pipe line is a carrier only, and not a purchaser or seller of oil. Crude oil (a raw material) is purchased by refiners who normally can make only short term commitments in order to maintain flexibility of supply against changing supply sources and changing demand. Therefore the oil pipe line is simply a specialized form of transportation, competing with other methods of moving liquid petroleum and with other sources of petroleum.

This discussion pertains to the oil pipe line, particularly in the transmission of crude oil.

Transportation cost is an extremely important element in the final cost of petroleum products. It is a key factor in the competitive position of the producer, refiner and marketer, representing 20-25 percent of the delivered price of petroleum products to the consumer. Pipe lines represent the most economical means of land transportation where volumes are sufficient to justify the investment. Substantial savings are then available as compared with less specialized methods such as rail or truck. The reduction in transportation cost varies with volume, length of haul and the transportation method displaced.

Producers may for instance, secure substantially higher wellhead price if pipe line movement can be utilized, rather than truck or rail. Similarly, refiners utilize pipe lines wherever possible for movement from refinery to distribution terminals. In short, the pipe line represents an operating facility, and the producer or refiner cannot wait for outside capital to initiate a pipe line project. The pressure of competition to reduce transportation costs is the basic stimulus forcing the oil industry into building and operating lines.

Physical characteristics of oil pipe line operation bearing on this subject can be summarized as follows:

1. It is fixed in geographical location and cannot be shifted with traffic pattern changes.
2. It is a one-way, one-purpose, facility.
3. It deals with a few customers whose refining operations can be substantially affected by the pipe line operation.
4. The capital investment is large and almost entirely employed in fixed plant. By corollary, total operating costs are relatively inelastic to volume since interest and depreciation charges form a substantial portion.

FINANCING

The specific purpose of the oil pipe line and its physical characteristics mainly determine the method of financing. Historically, for reasons noted previously, individual oil companies have built and owned pipe lines as they would any other facility in their operations. In recent years, however, the trend toward greater distance and larger diameter pipe lines has involved capital investments and throughputs much larger than any single company could undertake. Joint ownership has therefore evolved.

Public participation in pipe line financing in Canada was initiated by Imperial at the time of the Interprovincial Pipe Line development. The hope was to secure widespread participation from the individual investors in the equity financing of a project new to Canada and to Canadians.

The form of financing of large oil trunk line systems has logically developed to fit the characteristics of the operation. The normal financing pattern has been to borrow as much of the capital requirements as possible through bonds or debentures supported by oil company throughput or deficiency agreements. Thus debt financing is secured at a relatively low interest rate and the resultant leverage on the equity capital has been attractive to the investor.

In summary, the pipe line must be recognized as a primary facility to the producer, refiner and marketer, having developed to meet operating needs. It serves the same purpose as the tanker, the tank car or truck, and to this extent is not a general carrier.

Financing therefore cannot depend on normal entrepreneurs or independent investor action. Initiation should come from the industry and financial structure depends on the physical characteristics of the project, vis-a-vis the investor's requirements. These involve:

1. The large capital amounts required;
2. The return on total investment is limited by the pressure to minimize transportation costs;
3. Because of (2), financing entirely by equity capital is not possible, and
4. Because of its specialized service, outside financing is not possible without throughput or deficiency guarantees that can only be given by an oil company.

PIPE LINE REGULATION

Regulation and control of private enterprise in a free economy is presumably designed to guard the public interest where there is a clear danger to such interest. Since oil prices are limited by competition, and the oil pipe line is a means of minimizing transportation costs, the public interest in the operation of oil pipe lines could be confined to safety, public nuisance, etc. Nevertheless oil pipe lines in Canada are under regulation by both provincial and federal government legislation. This discussion pertains only to federal government legislation, and in particular the Pipe Lines Act, R.S.C. 1952, cap. 211. A more detailed examination of this Act is included in Appendix D supplementing the following general comments:

Jurisdiction

The Pipe Lines Act and other federal legislation define federal control over interprovincial pipe lines, and federal jurisdiction has been interpreted to include all pipe lines connected to interprovincial systems. Thus, if a flow-line from a well crosses a provincial boundary or a gathering system in a pool connects to an interprovincial system, it is considered to be within federal jurisdiction. Theoretically all companies operating such pipe lines would be required to have a charter granted by special act of Parliament and be removed from provincial jurisdiction. This has brought direct conflict with provincial jurisdiction, particularly in respect to matters of conservation of natural resources.

The British North America Act places control of most natural resources with the provinces. In exercising this control, the various provincial governments have assumed the right to grant exclusive permits to provincial companies for the purpose of gathering and transporting oil from producing fields. Such gathering systems usually connect with interprovincial trunk pipe lines and the provincial action is thus in direct conflict with the interpretation of federal legislation. Thus in the present situation the oil industry cannot in practice comply with both provincial and federal statutes. Elimination of this overlapping jurisdiction would be most helpful to the oil industry.

Corporate Regulation

It would appear to us that the present system of regulation as applied to oil pipe lines is unnecessarily complicated and cumbersome. It is felt that the tasks currently assigned to the

regulating authorities could be greatly eased by permitting the normal forces of competition as much freedom of action as possible. This could, we believe, be accomplished in considerable measure by dropping the practice of granting only single or exclusive permits for pipe line construction.

At present the Board of Transport Commissioners must review not only the physical but also the economic aspects of an application for a pipe line permit. Physical aspects insofar as they affect safety and public nuisance are obviously matters of public interest. On the other hand, it is our view that it is not necessary and, in fact, unduly onerous for the Board to have to examine economic factors, including the details of oil reserves, availability of markets, financing, and so forth. The economics of the project and in turn its ability to finance should constitute an automatic selection procedure without the necessity of a single or exclusive permit system. Close analysis by the professional investor would enable only the most economic projects to be financed. The public should be adequately protected in respect of any investment it may make in such pipe lines under the provisions of the present securities laws.

We also believe that the present requirement of incorporation by Special Act of Parliament is likewise an onerous burden on Parliament and frequently a source of unnecessary delay in dealing with pipe line developments.

Rate Regulation

Given free play competition between projects and the normal competitive pressure to reduce transportation costs tend to make rate regulation of oil pipe lines unnecessary. The history of modern regulatory bodies in Canada confirms this tendency since to our knowledge there has not been any instance of enforced rate reduction. On the contrary, rates have voluntarily responded to competitive pressures and to increasing volumes with the result that tariff reductions have been the general trend as volumes have increased.

Having in mind the purpose of oil pipe lines, we believe it unlikely that rates of return or tariffs will be established which could be considered an abuse or injurious to the public interest. The oil pipe line, as distinguished from the gas pipe line, has no franchise on the supply of a public commodity. It is not a public utility and indeed has an element of risk not common to other carriers.

There is a constant shifting in oil logistics occasioned by such factors as new discoveries, depletion of older fields, developments in competitive fuels or in competitive transportation facilities. The prospect of crude discoveries closer to an existing market is always present. So, also, the opening up of a closer and more favorable market large enough to absorb the full output of a producing area could force the existing market to seek an alternative source of supply. Either possibility, if realized, could cause the idling of some or all of a crude pipe line.

A few examples are listed:

1. For many years, Imperial owned and operated the Transit and Storage pipe line connecting its Sarnia refinery to Mid-Continent trunk line systems terminating in Ohio. With the advent of Canadian crude via the Interprovincial system Transit & Storage was put out of business.
2. The history of capacity increases in the Trans Mountain pipe line, starting in 1953 at 120,000 b/d and increasing by late 1956 to 185,000 b/d is even more dramatic. At this stage capacity was fully utilized and further expansion was started. Before this was complete, unpredictable political events and changes in market conditions reduced demand so sharply that in recent months deliveries have been at a rate of about 50 percent compared with a year ago, and at a level of only 40 percent of the expanded capacity.
3. The advent of crude discoveries closer to existing markets is another element of risk to pipe lines. Interprovincial expanded the capacity of its Edmonton/Regina

section to meet increasing demands of eastern markets. At this point, new discoveries and development of substantial Saskatchewan production displaced oil from the Edmonton/Regina section.

Such fluctuations in volume are experienced by all pipe lines and can be expected to repeat since crude oil markets are not captive and sources of supply also change.

SUMMARY

In summary, our view on pipe line financing and regulations are as follows:

1. Oil pipe lines and gas pipe lines are separate and distinct operations.
2. The oil pipe line is essentially an industry facility and its operation is similar to that of any other specialized industry equipment.
3. Public interest in oil pipe line operation can be adequately protected by competition and the pressure to reduce costs, together with existent security legislation.
4. The present Pipe Lines Act has undesirable features which can be considered a burden to Parliament and to industry. Specifically it is suggested that:
 - (a) The mechanism of issuing federal pipe line permits can be simplified and confined to an examination of the safety and nuisance aspects of the project by the Board of Transport Commissioners. The Board should also be free to issue permits to any project satisfying these physical tests.
 - (b) Some action is needed to eliminate the present jurisdictional conflict between federal and provincial regulatory authorities.

VIII. NATIONAL ENERGY POLICY AND NATIONAL ENERGY AUTHORITY

In view of the fact that a nation's economic progress depends on and can to a considerable extent be measured by its utilization of mechanical energy a national policy on energy has commended itself to many people. There is, we believe, broad agreement as to what should constitute a national policy. It should recognize that Canada's energy resources belong to the people of Canada and should be developed in their interest, as should other Canadian natural resources. It should recognize that Canadian progress is correlated with Canadian energy consumption, and that future supplies of energy producing materials should be assured in the light of the best available knowledge.

With these broad principles we find ourselves in complete agreement and find cause for satisfaction in the fact that these policies seem to have been satisfactorily implemented in that Canada is not only currently the second highest per capita consumer of energy in the world, but has remaining reserves equal to several centuries at the current rate of consumption as shown in the following table:

							Approximate Remaining Recoverable Reserves	Years of Supply*
Natural Gas (trillions of cubic feet) -	-	-	-	-	-	-	300 to 350	1,000 to 1,100
Liquid Petroleum (billions of barrels) -	-	-	-	-	-	-	40 to 60	160 to 240
Tar Sands (billions of barrels) -	-	-	-	-	-	-	100 to 300	400 to 1,200
Coal (billions of short tons) -	-	-	-	-	-	-	47	1,400

It has been estimated that about 1,000 billion barrels of crude oil will be obtained from the world's rocks. If this is the case, it appears that Canada, with 0.6 percent of the world's population, has around 15 percent of the world's fossil fuel energy reserves.

The estimate of coal reserves was taken from the Gordon Commission report. The ranges given for other reserves permit inclusion of various recent predictions and some allowance for Canadian sedimentary areas other than western Canada.

*At 1957 rate of consumption

NATIONAL ENERGY AUTHORITY

Recognition of the desirability of a national policy in regard to energy has in some cases become confused with a supposed need for a national authority on energy.

This company does not believe that the establishment of a national energy authority is feasible or necessary. There are two areas where control could be exercised, the field of domestic trade within the country or the field of export trade.

The fundamental difficulty in the creation of a federal authority having jurisdiction generally over energy within the country is that the provinces have authority over the production and sources of energy, and also control over the markets which consume energy within their individual borders.

We do not feel competent to discuss the constitutional aspects involved, but it seems to follow that any jurisdiction exercised by a federal authority would be limited to restricting interprovincial or international trade. Any effort to extend the jurisdiction of such a body would require the surrender by the provinces of their jurisdiction under some joint arrangement with the federal government. The historic experience in effecting such transfers of authority is that they involve either prolonged discussion to achieve mutual acceptance, or inter-governmental conflict if an attempt is made to impose an authority without mutual approval. The delay and/or conflict attendant on the effort to establish such a national energy authority would almost certainly inhibit continued development of the energy industries.

If the creation of a national authority is impracticable from a constitutional standpoint, its soundness is questionable from an economic and geographical standpoint. Beyond the fact that they

serve a similar purpose, the energy industries have practically nothing in common. Coal, petroleum, natural gas, hydro-electric, solar and atomic energy all differ from one another in respect to source, methods of processing, transmission or utilization. As a result, the requisites for successful development and the criteria for the preservation of the national interest vary widely among the different energy industries. Any close study of the peculiarities of these industries indicates that insofar as any regulation is necessary it must be of a highly individualized nature adapted to the particular industry.

This conclusion is reinforced by geographical considerations since the appropriate policy with regard to an industry in one part of Canada may be inappropriate to the same industry in another area.

A further complication lies in the changing nature of the energy industries themselves. Within the past few decades we have seen the virtual disappearance of firewood and the draft animal as energy sources. Within the next three decades we will almost certainly see the rise of atomic energy sources.

The variety and complexity of the energy industries raise not only the question of a national energy authority but the extent to which regulatory action can in fact be effectively taken. In a recent issue of the Harvard Business Review, Professor Otto Eckstein commented as follows on the conflict between those who desire more and those who desire less regulation:

"... the familiar conflict has taken on a new character today. Superimposed on the philosophical differences is a layer of doubt about the validity of some of the techniques of regulation themselves; many of them seemed to serve their purpose for a number of years but now may have become outmoded.

"This drift to obsolescence of once-appropriate approaches is especially serious in the case of industries being brought under public control for the first time. The dead hand of systems designed for other days and other conditions is being imposed on such industries automatically; government officials apparently are unaware that times have changed since the laws were first drawn. Furthermore, they fail to recognize that different businesses do have different needs and problems and that consequently regulations have to be carefully shaped if they are to be workable. Mechanical application of the same technique to every kind of enterprise will not produce sound economic results."

Over and above these questions as to the feasibility of the extension of authority over petroleum, we would raise the question of the extent to which any need has been demonstrated for such an extension.

In the preamble to this brief, we expressed our feeling that the national interest in regard to energy lay in the fulfillment of four objectives. These were:

1. That there be a high level of energy utilization by Canadians.
2. That there be large reserves of energy sources at the disposal of the Canadian economy.
3. That there be in existence markets which would provide reasonable economic stimulus to the growth of the energy industries.
4. That there should be continuing development of energy resources in line with markets available to provide not only the energy required but for the stimulus such activity gives to the economic development of the country.

None of these objectives we feel could be furthered by the establishment of a national energy authority, and some would actually be hindered.

On the first point, the fact that Canadians are the second highest per capita users of energy would indicate little need for regulatory action in this regard. The achievement of so high a level of energy utilization in a country which faces the transportation and climatic problems peculiar to Canada is evidence of a singularly high level of service and efficiency by the energy industries in Canada.

In our high energy consuming economy, the prairie farmers are highest consumers as a group. To them the advantages of nearby low-cost sources of crude and products are of great benefit. But the major consuming area in Canada is in Ontario and Quebec, accounting for some 50 percent of total national demand and a much higher percentage of the industrial demand for petroleum energy. In much of this area, high levels of consumption have been achieved because economical and flexible supplies have been available by tanker from South America, the U.S. Gulf, the U.S. Mid-Continent or the Middle East. For this highly important area of the Canadian economy, maintenance of a high level of consumption is equivalent to maintenance of much of Canada's industry. National policy must give due weight to the need for maintaining flexibility of supply for this major consuming area, since the freezing of its supply sources could only be carried out at grave risk to the level of energy consumption and hence economic activity.

With regard to the second point of national interest, reserves of energy resources, Canada is also singularly fortunate. As pointed out above, this nation has 0.6 percent of the world's population, 15 percent of its energy resources. With the very adequate energy resources on hand, there is little apparent need for the exercise of authority in this respect.

With regard to the third point, the need for markets which will stimulate resource development, we see very little ground for believing that a government can create markets, and any functions which the federal government can perform in this field are of a type which should be exercised by Parliament having regard to the possible effects of such actions. As pointed out in a previous section, this might only be achieved at the risk of either immediate or ultimate loss of other markets and at the expense of the consumer. In any event, it does not require the machinery of a national energy authority to achieve whatever may be possible in this regard.

With regard to the fourth point, the maintenance of resource development activity in Canada is dependent on the availability of markets and the developer's belief in his ability to supply those markets at a profit. There seems to be little that federal legislation or a nationally constituted energy authority could achieve in regard to either of these functions.

In short, the positive aspects of a national energy policy are either in the hands of nature in the form of natural resources or rely upon the ingenuity of buyers and sellers to bring about a high level of energy utilization which is the basis for market development at home and abroad. The negative aspect of a national energy policy, as suggested by some, consists of restriction on imports, an action for which machinery already exists without the creation of a national energy authority.

Need for Co-ordination and Exchange of Information

For the above reasons, we feel that a national energy authority would not further the achievement of those goals which we believe constitute the national interest in regard to energy. In fact, we feel that a national energy authority would actually impede progress. At the same time, we feel that there is need for a greater exchange of information and viewpoints in order to co-ordinate the existing municipal, provincial and federal authorities which operate in respect to energy. We have already pointed out the conflict in jurisdiction in regard to provincial and interprovincial pipe lines. In the federal field through the Combines Act and Criminal Code, every effort is made to maximize competition within industry. As we have pointed out in regard to crude oil producing, the system of land tenure in western Canada also acts to maximize competitive efforts in exploration and development. Yet in certain Canadian municipalities, we find restrictions on marketing outlets which are in direct opposition to the competitive principles applied by federal and provincial governments. One sees certain provinces encouraging the conservation of resources by strict regulatory measures, while at the same time we find other provinces discouraging the thrifty use of petroleum energy by imposing prohibitive taxes on diesel fuel. The co-ordination of policies at all levels of government, which can be achieved through a better exchange of information would be definitely beneficial in our opinion.

We believe there exists in the Department of Trade and Commerce a vehicle that could effect this co-ordination and at the same time be used by the Federal Government to carry out such policies as seem appropriate.

SUMMARY AND CONCLUSIONS

In this submission we have endeavored to assess the basic operating considerations of the Canadian oil industry in relation to the national interest as expressed in the Commission's terms of reference.

Two points that should be kept in mind in considering the summary and recommendations are given below:

1. No precise limits can be established for any particular segment of the energy field as rapid technical change evolves new forms, new uses and hence large-scale displacements between sources of energy. The utilization of energy resources cannot therefore be blueprinted exactly. Limitations on the normal development and movement of energy to consuming areas can affect the whole structure of existing industrial investment.
2. The oil industry is a high capital consumer in all its phases, including exploration, production, refining, transportation and marketing. The supply of equity funds and the ability of the industry to retain the investor's confidence are essential.

With these in mind, Imperial's views in regard to items of the Commission's terms of reference are as follows:

- (a) the policies which will best serve the national interest in relation to the export of energy and sources of energy from Canada

It is clear to us that the oil and gas industries, partly because of their location and partly because of the relatively small Canadian population, will require export markets if they are to develop in a healthy manner. Testimony before the Commission has indicated reasonable agreement on the amount of proved reserves of oil and gas. Worldwide experience has shown that proved reserves will be low in relation to the ultimate total reserves. Imperial believes that possible ultimate reserves of both oil and gas in Canada are very large.

The general opinion of industry as to the existence of such large possible reserves should be considered by the Commission in weighing the question of not only permitting but seeking export markets. It is recommended that a policy be established that Canada welcomes the opportunity to export gas and oil and that only under unusual circumstances will permission for such export be withheld under existing legislation.

- (b) the problems involved in, and the policies which ought to be applied to the regulation of the transmission of oil and gas between provinces . . .

In the general field of oil and gas transmission, provincial and federal regulations seem to have been established on a "general carrier" concept without recognizing the specialized nature of these facilities. Specifically, Imperial suggests:

1. Oil and gas pipe lines represent two distinct functions requiring different policies and degrees of regulation. The oil pipe line, as distinct from the gas line, is a facility of the industry and does not have a monopoly on the supply of a commodity. Unlike gas lines, which buy and sell under long-term contracts, oil pipe lines are carriers only and subject to the many risks associated with the constant shifting of the flexible petroleum supply pattern.
2. The exclusive permit system as presently required by the Board of Transport Commissioners is not necessary in the case of oil pipe lines where competition

between projects and between sources of supply together with securities legislation provide the best protection to the public and to the investor.

3. There is need for simplification of present procedures and for clarification of jurisdiction of the federal Pipe Lines Act in order to:

- (i) eliminate jurisdictional conflict with the provinces;
- (ii) reduce the time element in processing applications.

4. It is suggested that authority can be delegated to the Board of Transport Commissioners to grant permits for oil pipe line projects so long as they meet certain physical tests as to safety and public nuisance. Imperial does not object to the retention in the hands of government of the power to control rates and tariffs, but suggests that, as in the past, the competition between projects and the test of the marketplace will make it unnecessary and unwise to exercise this particular power.

- (c) the extent of authority that might best be conferred on a National Energy Board, . . .

Imperial does not believe that there is any practical basis for a National Energy Board in the sense of an energy authority, for reasons outlined in Section VIII.

It appears to us that flexibility in national policy is essential in order to recognize changing conditions, geographical considerations, etc. However, there is need for a continuing co-ordination of information between various levels of government which might well be handled by the Department of Trade and Commerce. At the same time, the Department could act as liaison between the federal government and provincial governments and industry, thus ensuring a continuous up-to-date picture of industry conditions as a guide to government policy. The opportunity to review the overall situation from time to time before commissions such as this also seems desirable.

- (d) whether, in view of its special relationship to the Northern Ontario Pipeline Crown Corporation and the nature of its financing and control, any special measures need be taken in relation to Trans-Canada Pipe Lines, Limited in order to safeguard the interests of Canadian producers or consumers of gas;

Imperial has no comment to make on this item in this submission.

- (e) such other related matters . . .

A principal part of this submission concerns the matter of markets for western Canada crude oil which has come under discussion due to the recent decline in crude outlet. Imperial, historically the largest single individual explorer in western Canada, with a high proportion of shut-in production, is naturally concerned with market development. The views expressed in this submission reflect our continuing assessment of market possibilities and also our actions over a period of years, during which we have undertaken very large financial obligations to expand the crude oil market and in the process successively displaced large crude oil purchases from affiliated companies. We have reluctantly come to the conclusion that the present marketing limits for Canadian crude cannot be economically extended further eastward by direct delivery. Should such an extension take place artificially, we believe the move would carry grave risk to the long-term well-being of the industry.

Our views and suggestions as to crude oil production and markets can be summarized as follows:

- A. The Canadian producing industry has experienced phenomenal growth since the Leduc discovery in 1947 and has extended its marketing perimeter by:
1. Heavy financial commitments assumed by certain companies in major transportation and refining facilities.
 2. Substantial price concessions which now leave wellhead prices of Canadian crude 30-45 cents per barrel less than comparable U.S. or Venezuelan crudes.
- B. Along with most other industries, Canadian crude oil production is currently showing a marked decline from previous high levels. In addition to the effect of the general economic recession, present domestic and export markets reflect an unusual combination of adverse factors, including warmer-than-normal weather, general world over-supply, adjustment of excess inventory position, and seasonal refinery maintenance shut-downs. Under these conditions, surplus capacity, which usually represents normal flexibility of supply, has for the present become excessive.
- C. The longer term prospects for the industry are bright. Normal economic markets will grow substantially with expanding economies and growing population. We believe that in view of the obvious need to supplement United States crude supplies, artificial trade barriers will not in the long run limit export markets.
- D. The problem, therefore, is that of bridging the gap between the immediate difficult position and the future in such a way as to preserve the necessary exploration incentive. The necessary risk capital to maintain exploration activity cannot be attracted by crude oil market volume alone, but requires as well reasonable price expectations. The Canadian producing industry cannot tolerate much further reduction in crude price relative to other areas without jeopardizing the flow of capital, bearing in mind that cost/price relationships will inevitably narrow as more remote areas are tapped.
- E. The history of development of markets for Canadian crude has clearly shown that the great overland distance from western Canadian fields to markets represents the big problem in meeting competition. From an economic standpoint, the most attractive markets for Canadian crude lie in the interior North American markets, where competition is from U.S. crude; and when competing with Venezuelan and Middle East crudes, the nearer seaboard markets of the west coast are preferable to the more distant eastern seaboard.
- F. The Montreal market, which could offer the largest potential new volume, involves major permanent pipe line commitments and other serious long-term disadvantages which in our opinion outweigh the volume advantage for the following reasons:
1. If considered on a competitive basis, Canadian crude oil at present prices would be laid down at Montreal at a disadvantage versus imported crudes. Furthermore, this disadvantage may be expected to increase during the life of a pipe line because of the inherent cost advantage of imported crude. Since neither the producers nor the refiners could be expected to make open-end, inflexible commitments under these circumstances, it is difficult to see how a pipe line could be financed as a commercial venture.
 2. If considered on the basis of the government giving full guarantees of whatever protection may be required now or in the future, the results would appear to be:
 - (i) higher costs to be met by the consumer or taxpayer;
 - (ii) a complex permanent system of protection leading to an increasingly high degree of government control and jeopardy to the future freedom of industry action and flow of new investment capital into the industry.

- G. We believe the first objective should be to expand the use of Canadian crude in existing markets, where because of better economics and flexibility, the problems involved are appreciably less than in the case of Montreal. The first of these markets is Ontario, where action on the part of individual refiners and marketers could provide increased outlet for Canadian crude. The second market, where a higher degree of saturation should soon become possible, even under U.S. import quotas, is in the Puget Sound area, as the industry's high inventory position is liquidated and normal demand growth resumes.
- H. It is believed that, along with recovery from the business recession, successful expansion of Canadian crude sales in the Ontario and Puget Sound markets could preserve the necessary exploration incentive.
- I. The most effective immediate steps which the federal government might take to assist the production and market sectors of the oil industry are:
1. Revise depletion regulations to a basis not less favorable than that enjoyed by producers of competitive foreign crude. In all markets, Canadian crude faces competition having an advantage equivalent to the favorable U.S. depletion treatment. The current Canadian depletion allowance penalizes rather than encourages the primary explorer. The depletion problem has been presented to the federal government regularly for a number of years by the Canadian Petroleum Association and by individual company spokesmen, and complete information on this matter is available to the federal tax authorities.
 2. Make continued representation to the U.S. government on the application of import quotas to Canadian oil, particularly after a decision is reached on the extension of the Reciprocal Trade Act. Such representation should be made at the highest level with full attention to the future rather than the current position.

APPENDIX "A"

CRUDE OIL RESERVES

Estimates of crude oil and natural gas reserves are usually presented under three classifications — proved, probable, and possible. These, in turn, may be expressed as either ultimate or remaining reserves. Used in this sense, probable reserves include proved, and ultimate reserves are equivalent to remaining reserves plus accumulated production.

Proved and Probable Remaining Crude Oil Reserves

Imperial Oil Limited has prepared estimates of proved and probable remaining reserves of crude oil in western Canada using rules similar to those used by the Canadian Petroleum Association. The comparison is shown in Table I.

TABLE I
Reserves Estimates for December 31, 1957
(Billions of Barrels)

	I.O.L.	C.P.A.	Difference
Proved Remaining - - - - -	2.75	2.86	4.0%
Probable Remaining - - - - -	3.77	3.68	2.4%

The differences are considered to be minor and well within the range that would be expected from independent estimates.

Possible Crude Oil Reserves

One of the more commonly used yardsticks for expressing the quality of a sedimentary basin has been the number of barrels of oil per cubic mile of sediments. Lewis G. Weeks of Standard Oil Company (New Jersey) has published several papers on this subject and is recognized as an outstanding authority on petroleum geology. Mr. Weeks has applied his volumetric approach to many of the world's sedimentary basins and his estimates of possible crude oil reserves worldwide average 30,000 barrels per cubic mile. His estimates for the continental United States are 50,000 barrels per cubic mile of sediments. To our knowledge, no similar study has been made for Canadian sedimentary basins. However, the application of Weeks' volumetric estimates to the sedimentary basins of western Canada gives the following figures:

Sedimentary Area	Volume of Sediments (cubic miles)
Northwest Territories and Yukon - - - - -	215,000
Alberta and N.E. British Columbia - - - - -	506,000
Saskatchewan and Manitoba - - - - -	169,000
Total - - - - -	890,000
Possible Reserves at 30,000 bbl/cu. mile = 26.7 billion barrels	
at 50,000 bbl/cu. mile = 44.5 billion barrels	

All authorities stress the caution with which such figures should be used. They are not, as Weeks has pointed out, proven or probable reserves, nor should they be used as such. In fact, while the volumetric approach is believed to give figures of the right order of magnitude, they might be highly inaccurate when applied to individual basins. Several of the basin areas of the United States have a comparable geologic setting to the sedimentary area of western Canada so that use of the U.S. yardstick is considered reasonable.

In any event, while the order of magnitude of the numbers may be reasonable, it is important to note that the realization of these numbers is in the almost unlimited future. The key lies in the *rate of finding* and the key to the rate of finding lies in the *incentive to explore*.

Summary of Crude Oil Reserve Estimates — Western Canada

(Billions of Barrels)

Proved Remaining	-	-	-	-	-	-	-	2.75
Probable Additional	-	-	-	-	-	-	-	1.02
Probable Remaining	-	-	-	-	-	-	-	3.77
Possible	-	-	-	-	-	-	-	27 - 45

Natural Gas Reserves

X/ The natural gas reserves of Imperial Oil Limited amount to slightly more than 1 trillion cubic feet, most of which is in the form of gas cap gas and dissolved gas and most of this volume is therefore committed to conservation projects and programs. Therefore, due to limited participation in natural gas, Imperial's reservoir engineers have not studied the industry reserves in any detail. Consequently, no reserve estimates on natural gas are submitted.

APPENDIX "B"

CRUDE OIL PRODUCIBILITY

An important indicator of the growth of the crude oil producing industry in western Canada is that characteristic known variously as producibility, potential, productivity, maximum efficient rate (MER), and maximum permissible rate (MPR). While it would be untrue to say all these terms are synonymous, they imply generally the same thing and their respective values are similar. For the purpose of this submission the word "producibility" will be used and it may be defined simply as the maximum sustained rate at which western Canada can produce without seriously reducing the ultimate recovery.

Present Producibility

The present producibility is obtained by adding the MPR's of all pools in western Canada subject to the following modifications:

1. Certain pools in advanced stages of depletion do not have published MPR's. Their producibility, measured by actual production performance, must be added to the total.
2. In most pools for which MPR's are established there are some wells physically incapable of producing their MPR's. This inability must be subtracted from the total.
3. Many wells, while capable of producing at their MPR's, can only do so by withdrawing excessive quantities of gas or water. Failure to return these fluids to the formation results in penalties which also must be subtracted from the total. The need for estimating in (2) and (3) above results in slight variations in the producibility figures quoted by different people.

Imperial's engineers have estimated western Canada's producibility at December 31, 1957, to be 935,000 barrels per day. Of this amount about 2 percent is heavy crude and about 7 percent is medium gravity, sour (high sulphur content) crude. This leaves 91 percent or 855,000 barrels per day in the light crude classification.

Future Producibility

Producibility in the future will depend a great deal on the rate at which new oil reserves are found, in essence the pace of exploration.

The following matters are pertinent to assessment of this pace.

Different companies have different approaches to the end of acquiring petroleum reserves. Some tend to concentrate their efforts on what might be termed "primary" exploration, entering new areas where little is known of the petroleum prospects, and trying to find a key to possible accumulations in those areas. Others prefer to start their operations after this first phase is done, participating in the land play and relatively intensive exploration that follows the initial discovery. Still others are engaged in the acquisition of more or less proved reserves in producing fields through the purchase of leases. Of course, many companies take part in two or all three of these phases, perhaps emphasizing one in relation to the others. All three phases are important in our competitive system.

But the primary explorer has made possible the existence of the other two and primary exploration must be carried on as a long-term and continuing operation if it is to have a reasonable chance of economic success. From the first regional analyses, through the process of acquiring sufficient acreage to justify the large expenditures to follow, and on through all the normal sequence

of exploration to final testing with the drill, continuity is of greatest importance. Since the chance of final success in any one area is relatively small, the primary explorer must diversify his efforts and continue to work from one area to another, making his successes carry his failures. A large staff of highly-trained technical people provides the lifeblood of such an operation.

Exploratory Drilling

The portion of total exploration effort that is represented by exploratory drilling, while only amounting to 25 to 30 percent of total exploration expenditures, has remained fairly constant in recent years and is considered to be the most reliable indicator of the pace of exploration. For this reason it can be used, as such, in forecasting new reserves and producibility.

Figure 1 shows some estimates of exploratory wells to be drilled over the next six years. In 1957, 967 exploratory wells were drilled in western Canada compared with an average of 886 wells a year over the last five years. For the purpose of the forecast presented here, three future levels of drilling activity have been considered as follows:

Level A — Exploratory drilling increases steadily over the next three years to level out at a point 20 percent higher than the 967 wells of 1957.

Level B — Exploratory drilling continues at the 1957 level of 967 wells per year.

Level C — Exploratory drilling decreases steadily over the next three years to level out at a point 20 percent below the 967 wells of 1957.

Finding Rate

Up to the end of 1957, a total of 7,786 exploratory wells had been drilled in western Canada. The probable ultimate reserves of crude oil found by this drilling amounted to 4,688 million barrels. This gives a cumulative average finding rate of 603,000 barrels per exploratory well.* Such an average rate is only valid when applied to a very large number of wells. The number should not be considered to indicate the likely result of drilling any one well or even a small group of wells. The fact is that about 80 percent of the exploratory wells in western Canada have found no commercial oil or gas. The average is maintained by the few wells that find very large reserves.

Oil finding in Canada has been sporadic and wide variations in results have occurred from year to year. Thus a year-by-year plot of historical finding rates gives no reliable trend on which to base a forecast. Experience in the United States, where the number of annual exploratory completions has been 12 to 15 times the number in Canada, is on a broader base and covers a much longer period. A study of the statistics for the United States reveals a steady downward trend in the finding rate as drilling density increases and the present level is between 200,000 and 250,000 barrels per exploratory well.** The Canadian industry is at a much earlier stage of development and this is reflected in the higher finding rates experienced to date. But it seems reasonable to expect that a decline will occur in Canada, just as it has in the United States, as drilling density increases.

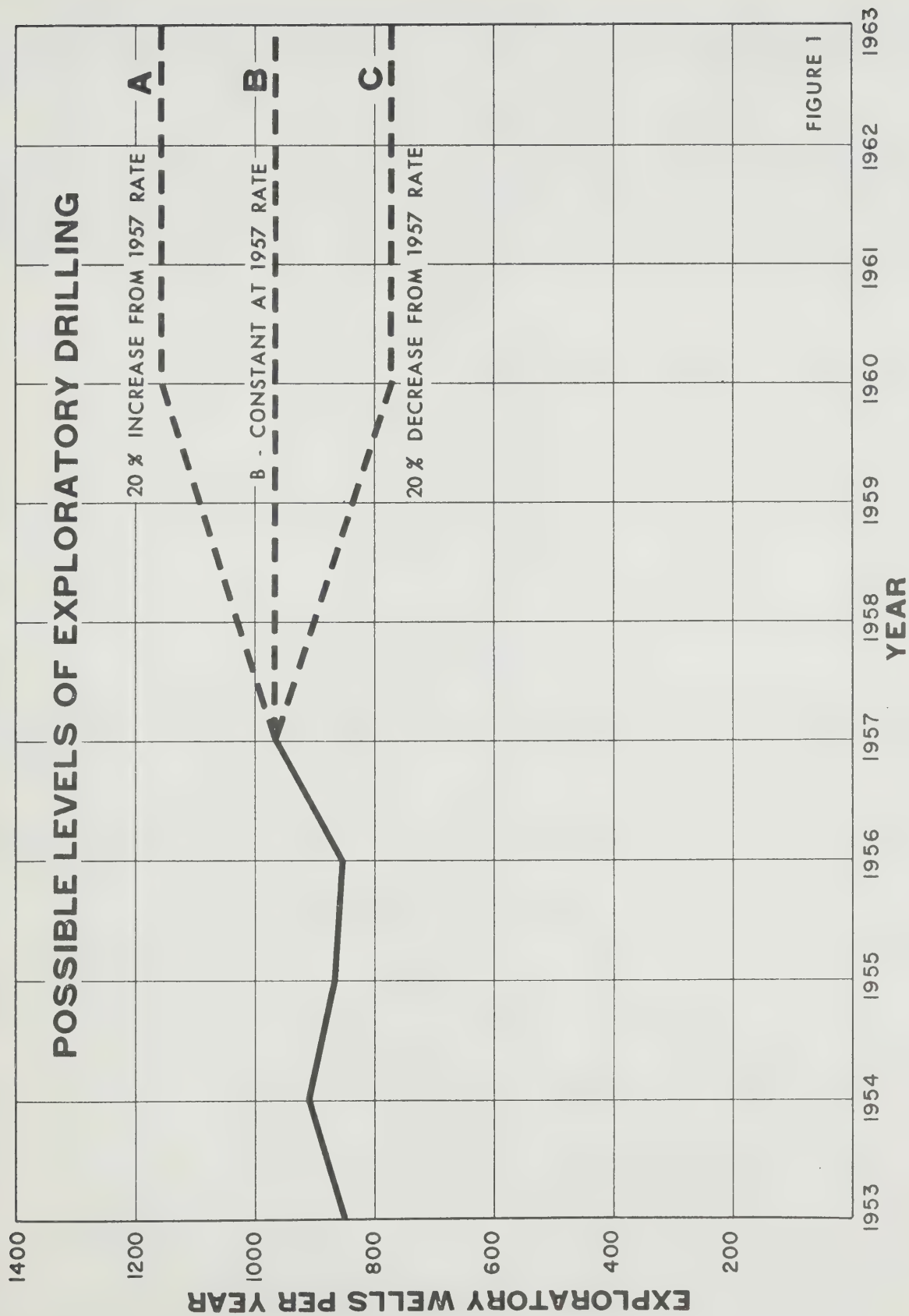
*Some analysts base their statistical finding studies on other indices such as "barrels found per wildcat well". Certain definitions of well classifications have become widely recognized in the industry and the most common set of definitions is credited to Lahee and is the standard for the American Petroleum Institute. These definitions include the following classes of exploratory wells:

Outpost
Shallower Pool Test
Deeper Pool Test

New Pool Wildcat
New Field Wildcat

The finding rate figures used in this presentation are in terms of barrels per "exploratory well" which includes wells of all the above classifications.

**Hill, Kenneth E., Hammar, Harold D., and Winger, John G., "Future Growth of the World Petroleum Industry", April 1957.



For this study, it has been assumed that the finding rate in western Canada will decline slowly from a current level of about 600,000 barrels to 540,000 barrels per exploratory well six years from now.

New Reserves

Three forecasts of new reserves to be found over the next six years have been made by multiplying the number of exploratory wells to be drilled in each year, as represented by levels A, B, and C respectively on Figure 1, by the predicted finding rates just discussed. The following table shows the volumes of new reserves predicted for each of the next six years as a result of the three levels of exploratory drilling which have been considered.

TABLE II
New Reserves

										Exploratory Program A	Exploratory Program B	Exploratory Program C
										(Millions of Barrels Found)		
1958	-	-	-	-	-	-	-	-	-	608	570	532
1959	-	-	-	-	-	-	-	-	-	635	561	486
1960	-	-	-	-	-	-	-	-	-	661	551	441
1961	-	-	-	-	-	-	-	-	-	650	542	433
1962	-	-	-	-	-	-	-	-	-	638	532	426
1963	-	-	-	-	-	-	-	-	-	626	522	418

Development of New Reserves

There is a considerable time lag between the finding of a new field and the development of that field to full producibility. This delay must be taken into account in a forecast of producibility. Generally it may be said that the industry tends to show more variations in development pace than in exploration.*

From study of the histories of pool developments and from a consideration of current conditions, an average development period of four years has been assumed for future discoveries in this submission.

Forecasts of Producibility

Figure 2 presents forecasts of producibility for the three levels of exploratory drilling which were presented on Figure 1.

*Development pace after discovery will be influenced by the following factors as shown:

<i>Factor</i>	<i>Relatively Rapid</i>	<i>Relatively Slow</i>
Geographic location	If roads, communications and pipe lines are already developed	If roads, camps, pipe lines, etc., have to be built on remote and difficult terrain
Geology	If the pool outline can be easily interpreted or delineated	If complex geology makes it difficult to define the productive limits of the pool
Producibility characteristics	If favourable	If unfavourable
Mineral leases and lessors	If there are many operators and many mineral owners	If there are few operators and few mineral owners
Drilling conditions	If the productive formations are shallow and easily reached with the drill	If the productive formations are deep and/or the overlying rocks are difficult to penetrate

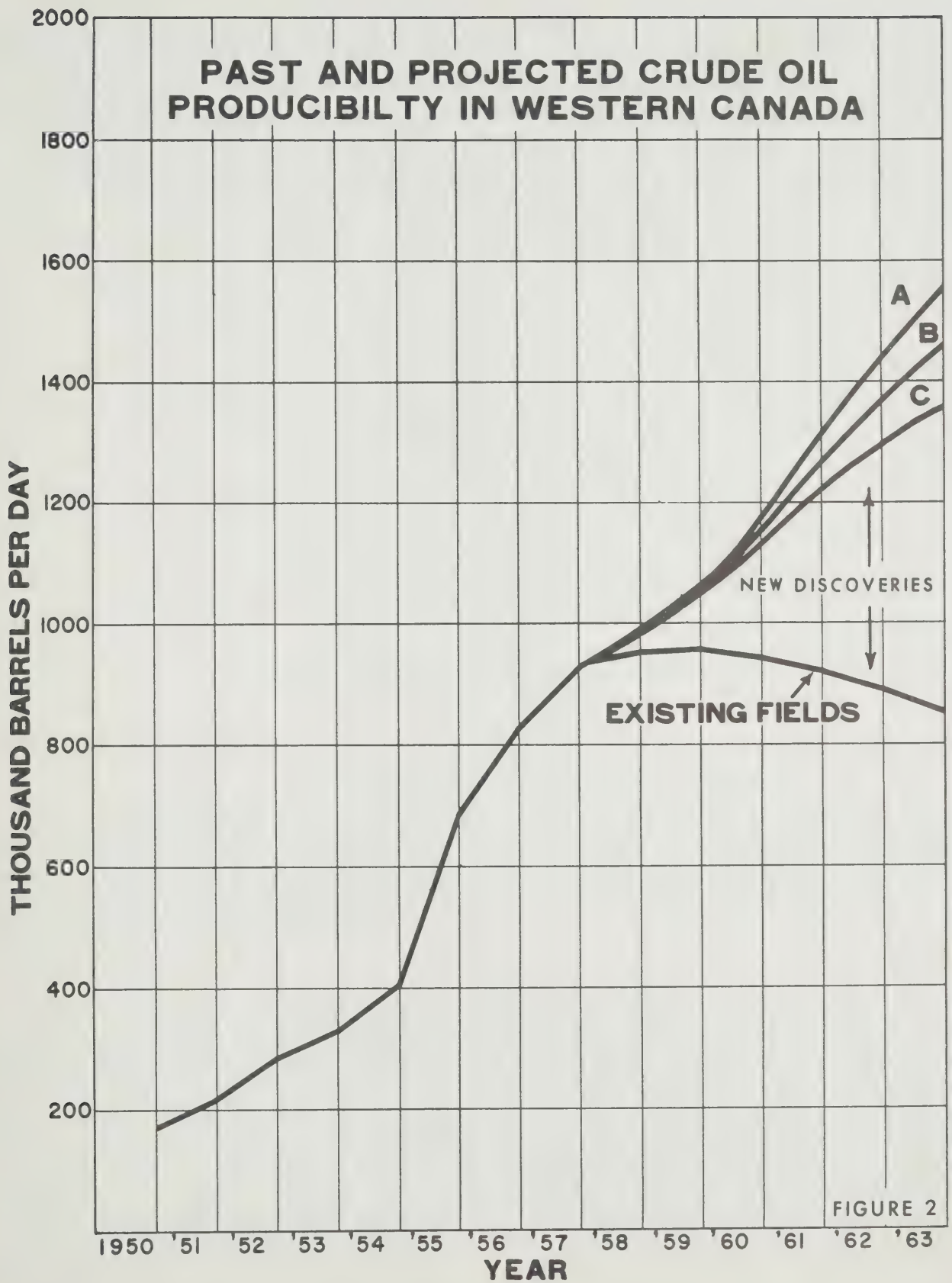
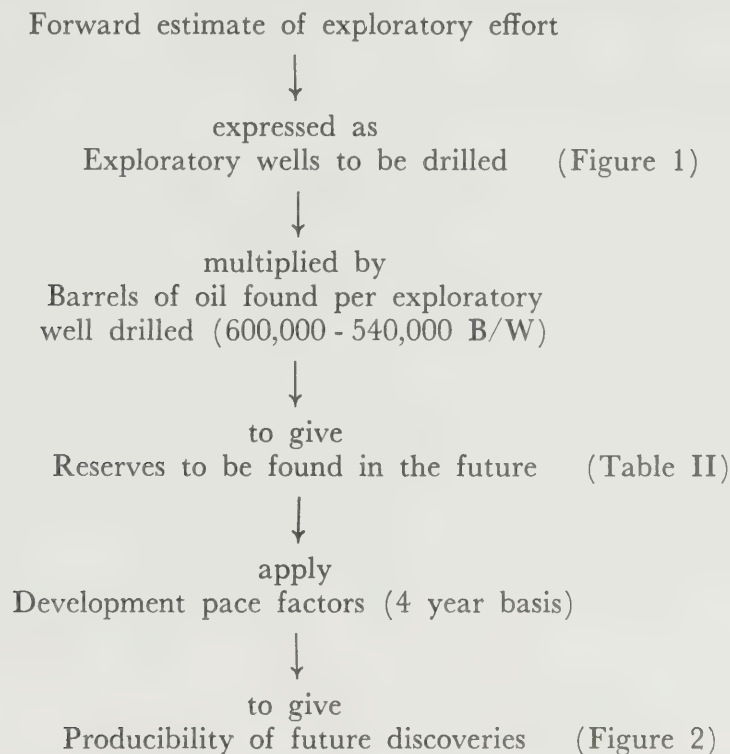


FIGURE 2

The lower line on the graph indicates the estimated producibility of fields now known, assuming no new discoveries are made in the meantime.

The three upper lines on the graph show the forecast total producibility when allowance is made for new discoveries. The top line corresponds with exploratory drilling level A and the two succeeding lines with levels B and C respectively.

By way of review, the estimating sequence used in predicting the producibility of new discovery pools was as indicated in the following flow diagram.



It is obvious that the forecast of exploratory effort is a vital factor in arriving at the end result of producibility estimates. It may be useful therefore to refer again to the exploratory drilling forecast given in Figure 1 and to explain some of the philosophy behind these particular efforts. There are certain underlying factors which affect the short-term forecast, and others that have a bearing on the activity in the long term.

(a) *Short Term*

The industry has a built-in momentum which is the dominating factor in the pace of exploration of any immediate future period (say, two or three years). In its simplest terms, an exploration play involves acquiring land, conducting geological and geophysical investigations, and, finally, drilling one or more exploratory wells. In the ordinary course of events, such a program cannot be carried out in less than two years, and may take much longer. Over this whole period, a company must have and maintain an exploration staff of trained geologists, geophysicists, and land men. Thus, when a program is underway, the continuing expenditures required to maintain experienced staff, together with other pre-drilling investments in land and surveys, cannot be abandoned except under very unusual circumstances. Minor fluctuations in the economy will change the tempo only slightly over the short term.

(b) *Long Term*

Long-term forecasts of exploratory effort differ from short-term projections in that they go beyond a mere continuation of current exploration projects and consider the commencement of

entirely new exploratory plays. Thus the intensity of exploratory effort over the long term depends entirely on incentive in the form of profitable markets and on a favorable political climate to attract risk capital. If these conditions are favorable, exploration will continue at the rate necessary to find the new reserves to meet market requirements.

Conclusions re Producibility

The following conclusions apply to the estimates represented on Figure 2.

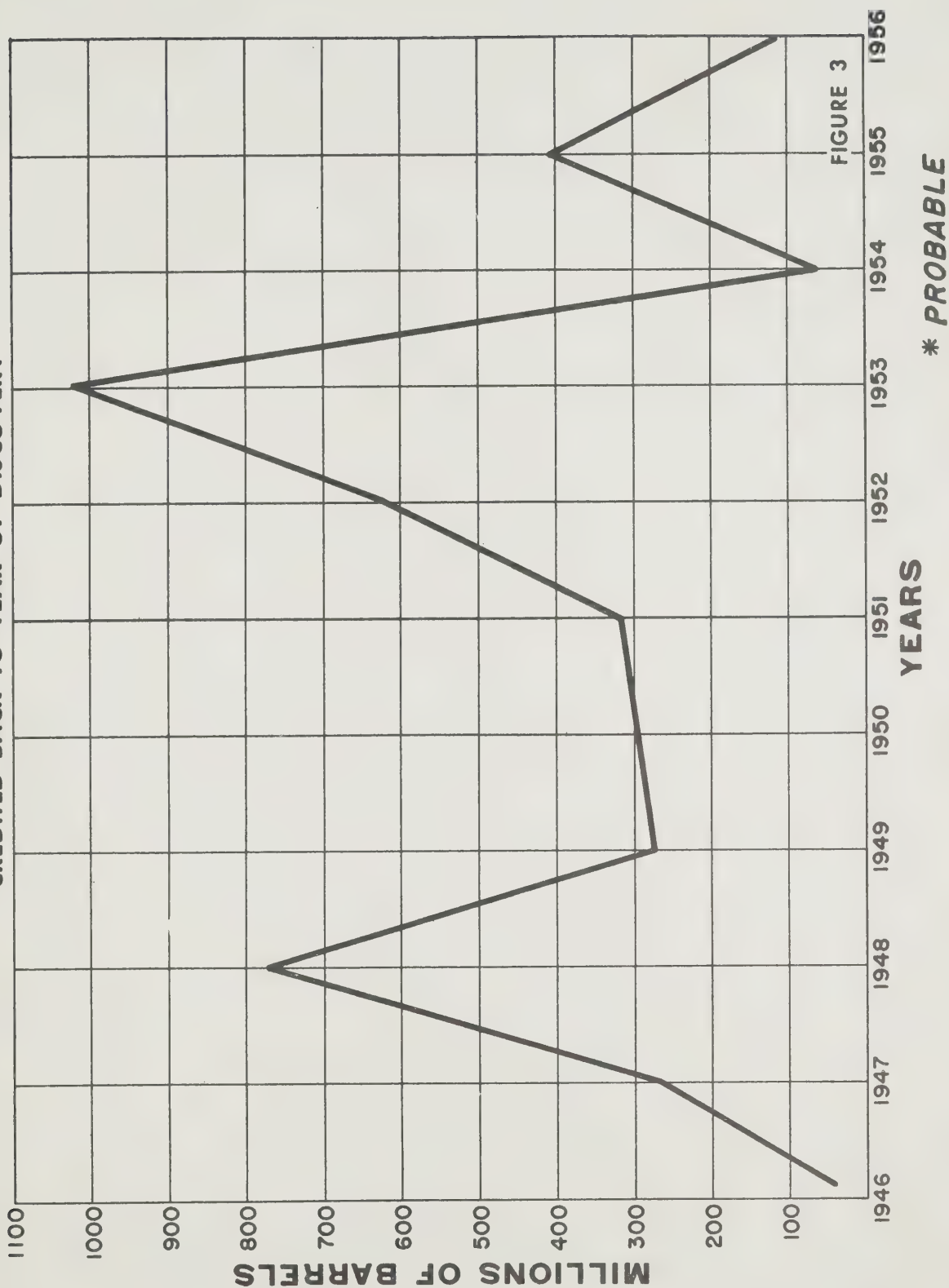
1. Industry producibility of about 1.05 million barrels a day can be expected at the commencement of the year 1960.
2. Producibility in the order of 1.35 to 1.55 million barrels a day is possible by about the end of 1963.
3. The producibility range of 1.35 million barrels a day to 1.55 million barrels a day may seem narrow considering the fact that the limiting assumptions are exploration efforts 20 percent above and 20 percent below present base. Naturally, the range would widen if projected further into the future. However, this does illustrate that there is a considerable time lag between the commencement of exploration and the full production impact that stems from the exploratory venture.

The estimates assume that industry will strike averages each year both in exploration results and in development pace. In reality, this does not often happen.

Figure 3 portrays the annual exploration results since 1946 in terms of present estimates of the probable reserves found in each year. It may not be quite true to say that oil finding has been cyclical, but there are certainly indications of periodicity with series of prolific discoveries being followed by several years of disappointing results. Thus, both the size and the timing of new discoveries can alter forecasts of this type.

INDUSTRY EXPLORATION RESULTS ANNUAL ADDITIONS TO RESERVES* 1946 - 1956

CREDITED BACK TO YEAR OF DISCOVERY



APPENDIX "C"

PRODUCING ECONOMICS

Most companies engaged in the production operation accumulate each year's business by segments of cost as follows:

(a) *Operating Costs*

All wages, materials, supplies, services and taxes (excluding income tax) that pertain to production expense plus overhead. Shown as an annual total.

(b) *Depreciation of Development Capital* as calculated in the following manner:

- i. Surface — capital cost of surface installations that are part of the production operation (such as tanks, separators, etc.) — depreciated over the approximate life of the asset — expressed in \$/year.
- ii. Subsurface — capital cost of drilling and completing each successful well divided by the net barrels of reserves under the spacing unit assigned to the well. Thus, as each barrel is produced, the same depreciation is taken and the capital is amortized over the life of the reserve — it is expressed in \$/year by multiplying by the net barrels produced in the year. (Some companies use "time depreciation" on subsurface capital investment.)

(c) *Exploration Costs*

Consists of bonus payments for mineral leases, mineral lease rentals, exploration research, geological operations, geophysical operations, exploration drilling and supervision. Shown as an annual total.

The above represents the normal method of booking costs for accounting purposes. Clearly each cost segment is related to the revenue of a fiscal year as in a profit and loss statement.

However, to assess the profitability of the producing operation it is necessary to relate investment to the barrels of reserves found and developed and thus reflect the size of the reserves available for future production. Thus, to measure profitability, the three cost segments should be related as follows:

$$\begin{array}{lcl} \text{Operating Cost} = & & \frac{\text{Dollars Spent}}{\text{Annual Net Production (Net Barrels)}} \\ \\ \text{Development Capital Cost} = & & \frac{\text{Dollars Spent}}{\text{Drilled Reserves (Net Barrels)}} \\ \\ \text{Acquisition Cost} = & & \frac{\text{Dollars Spent}}{\text{Probable Ultimate Reserves Found (Net Barrels)}} \end{array}$$

The total of these is commonly referred to as "replacement cost".

While the expression of this cost is simple, as it merely represents the annual or cumulative expenditures of the producing industry, it is in fact difficult to obtain precise figures of the industry dollar expenditures broken down into the three segments required and it is even more difficult to get precise figures on reserves.

To overcome these difficulties, Imperial Oil Limited has for some years now assembled "unit of work" statistics of the producing industry, and has applied to these statistics the best possible

estimate of accompanying dollar costs. It is believed, therefore, that the estimates of industry costs used hereafter are a fairly accurate portrayal of producing cost history in western Canada.

Since operating costs are related to annual production and development capital costs are related to drilled reserves, these ratios can be estimated with reasonable accuracy. Acquisition costs however, being related to ultimate probable reserves found, present a more complex problem, since an insufficient backlog of production history is available to accurately pinpoint ultimate reserves in any of the active areas of western Canada.* Since very little historical background exists upon which trends can be established, the unit costs which will follow in this section may be said to reflect current estimates which may be subject to future revisions.

Finally, the problems of separation or integration of natural gas reserves and exploration costs have not been attempted since Imperial's natural gas data are quite limited.**

The foregoing general comments were for the purpose of emphasizing the difficulties involved in estimating industry economics. Despite these difficulties five short studies were prepared and are presented in this Appendix.

The five cases are:

1. Replacement costs for crude oil based on industry statistics — Case A.
2. A specific unsuccessful exploration experience of Imperial Oil Limited — Case B.
3. A successful exploration venture of Imperial Oil Limited — Case C.
4. A hypothetical experience of a successful producing company — Case D.
5. A hypothetical experience of another producing company (marginally successful) — Case E.

CASE A

Replacement Costs (Based on Industry statistics)

If the industry is to sustain itself it must acquire and develop for production, a barrel of reserves for every barrel of oil actually produced. It may be said, then, that the total expenditures of the petroleum industry, related to barrels acquired, developed, and produced, are a measure of the industry's crude oil replacement costs. It follows that the relationship between crude oil replacement costs and realization provides a measure of the economic wellbeing of the industry.

*Relatively speaking, the modern Canadian oil business is very young. Today, there are areas in western Canada that have been actively explored for the last seven or eight years — they are being actively explored now and there is a very good chance that they will be under active exploration for at least a decade in the future. The exploration being done today will be applicable to reserves discovered in the future and the question arises as to whether such costs should be applied against today's probable reserves estimates in determining current acquisition costs or whether they should be more properly applicable against reserves that will be found in the future. The only reasonable solution appears to be to take the view that exploration will be conducted in favourable areas for years ahead and that additions to present reserves estimates will be made for years in the future and that, therefore, the only practical solution is to apply current costs to current reserves estimates.

**It is recognized that the large reserves of natural gas are a credit to the industry exploratory effort. However, in view of the extremely long delay in obtaining markets for much of the gas, there is considerable uncertainty in how to value the reserves. The value of the natural gas reserves was therefore not included in determining acquisition costs although it is recognized that it does have value and would in fact reduce acquisition costs by a small amount. Natural gas liquids reserves have been included in probable ultimate reserves used in calculating acquisition costs.

The succeeding figures are based on estimates of actual industry operations over the period 1947 to 1957, the costs having been accumulated* and averaged on Imperial estimates of industry annual dollar expenditures for each of the acquisition, development, and operating categories. The costs are expressed on a per barrel basis and added to determine the replacement cost per barrel. In each case the actual dollar expenditures have been adjusted by applying the General Wholesale price index to reflect more accurately the true replacement cost in terms of 1957 dollars.

TABLE I
Acquisition Cost

Year	Accumulated Total Acquisition Cost Thousands of \$	Accumulated Ultimate Probable Reserves Thousands of Net Bbls.	Accumulated Acquisition Cost \$ per Net Bbl.
Prior to & incl. 1947			
1947	79,212	560,041	.14
1948	117,008	1,331,517	.09
1949	197,864	1,576,761	.12
1950	320,020	1,835,702	.17
1951	460,158	2,118,066	.22
1952	661,841	2,714,474	.24
1953	849,776	3,698,194	.23
1954	1,106,027	3,848,809	.29
1955	1,351,758	4,127,716	.33
1956	1,635,803	4,240,110	.39
1957	1,942,384	4,414,430	.44**

Development Capital Cost

It is assumed that the amount of developed reserve as of December 31, 1957 was 95 percent of the proven reserve of 3.30 billion net barrels or 3.03 billion net barrels. Cumulative development costs amounted to \$1,039,995,000.

The development capital cost ratio is therefore —

$$\frac{\$1,039,995,000}{3,030,000,000} = \$0.34/\text{net barrel}$$

Operating Costs

In Table II an estimate has been made for industry operating costs. The figures have been built up independently by Imperial Oil Limited, based on judgment and experience and are believed to be representative of actual industry operating cost history in western Canada.

*The procedure of using accumulated past costs may not seem compatible with the objective of calculating a replacement cost, which implies the use of current and future costs. However, the wide annual variations in finding coupled with the short history in western Canada renders impossible the establishment of a trend in acquisition costs. The only practical solution appears to be the use of accumulated costs and accumulated reserves to reflect the costs per barrel to date, leaving to subjective judgment the extent to which future costs may vary.

**If the five year period of 1953 through 1957 were taken the acquisition cost would be $\frac{\$1,699,956}{1,699,956} = \0.75 per barrel.

1,699,956

However, 1957 reserves are probably understated, making this five year average acquisition cost somewhat high.

TABLE II
Operating Costs

Year	Accumulated Cost Thousands of \$	Accumulated Production Thousands of Net Bbls.	Cost \$ per Net Bbl.
Prior to & incl. 1947	23,310	80,825	.29
1948	32,360	90,863	.36
1949	42,690	108,692	.39
1950	57,870	133,097	.44
1951	78,470	173,863	.45
1952	104,500	226,355	.48
1953	130,170	295,654	.44
1954	165,060	377,851	.44
1955	217,460	488,708	.44
1956	289,696	636,001	.45
1957	365,348	792,071	.46

From the preceding data the following replacement cost calculation can be made:

	Actual Dollars	Adjusted Dollars
Cost of acquisition - - - - -	0.44	0.46
Cost of development capital - - - - -	0.34	0.36
Cost of operating - - - - -	0.46	0.48
Replacement cost per net barrel - - - - -	1.24	1.30 ✓

Realization

In Table III the weighted average wellhead crude price for western Canada for the years 1948 to 1957 are given.

TABLE III

	\$ per Bbl.
1948 - - - - -	3.15
1949 - - - - -	2.90
1950 - - - - -	2.95
1951 - - - - -	2.45
1952 - - - - -	2.33
1953 - - - - -	2.48
1954 - - - - -	2.54
1955 - - - - -	2.36
1956 - - - - -	2.37
1957 - - - - -	2.52 (estimated)

For comparison purposes the 1957 average is compared to some other well known crude sources in the Western Hemisphere as follows:

Western Canada Average (wellhead) - - -	\$2.52 ✓
Redwater - - - - -	2.63
Pembina - - - - -	2.61
U.S. Mid-Continent 35° - - - - -	3.05
Guanipa 30° (f.o.b. Puerto la Cruz, Venezuela)	2.78

Comparison Between Realization and Replacement Cost

The replacement cost amounts to roughly 50 percent of the realization. The difference between realization and replacement provides the amount available for payment of income tax, cost of money and profit.

The cost of money is a most important factor. In the producing industry, the investment is made in total before a dollar of income is received, and the prime asset (i.e., oil and/or gas reserve) is produced very slowly over a period of years. Hence, the income from the investment will not be realized, in total, for a period of 10 - 40 years (i.e., until the reserves are depleted).

Thus, the realization and replacement cost compare as shown in Table IV.

TABLE IV

								Future Worth	at 6% & 20 yrs.	Present Worth* at 6% & 25 yrs.	at 6% & 30 yrs.
									Dollars Per Barrel		
Realization	-	-	-	-	-	-	-	2.52	1.64	1.50	1.29
Replacement	-	-	-	-	-	-	-	1.30	1.12	1.10	1.06
Margin before tax	-	-	-	-	-	-	-	1.22	.52	.40	.23
Income Tax**	-	-	-	-	-	-	-	.41	.22	.19	.15
Margin after Tax	-	-	-	-	-	-	-	.81	.30	.21	.08

Carrying the conclusion one step further, these margins can be calculated as a rate of return (using the investor's method), and they are within the range of 7 to 12 percent after tax. Imperial feels that rates of return of this order are the minimum necessary to attract the risk capital required in the exploration effort that lies in the future.

CASES B AND C

Case Histories

When considering the oil producing industry's growth potential, average industry economics do not tell the full story. Contained within those industry averages are figures representing a wide variety of failures and successes. To illustrate this point, two examples have been worked out on the basis of actual case histories taken from the records of Imperial Oil Limited.

The cases were not selected merely because of the indicated results. Rather, the projects on which these two studies were based were of a nature that permitted a reasonably clear-cut allocation of costs and results. Case B represents a completely unsuccessful exploratory venture. Case C presents a picture of a moderately successful venture in which an exploratory program uncovered commercial oil in sufficient volume to pay back the costs of both exploration and development and still leave a small margin of profit.

*The use of 6% is perhaps a low figure — it is only slightly more than the present day prime borrowers' rate of 5¼%.

**Since such items as most exploration expense, operating expense, and a portion of development capital cost may be written off for tax purposes in the year in which they are incurred, or (with the exception of operating expense) carried forward indefinitely, the payment of income tax will be delayed for some years, and the present worth calculations take this into consideration.

CASE B

A Specific Unsuccessful Exploration Experience of Imperial Oil Limited

This is the history of a project in which a block of Crown acreage was taken under reservation by Imperial. The Company planned a systematic exploratory program aimed at finding commercial oil or gas. Had this exploratory endeavour yielded the desired results, up to 50 percent of the acreage could have been converted to lease in the Company's name, with development drilling and ultimate marketing of the produced substances following in due time. The remaining acreage would have reverted to the Crown for possible disposal by sale to various operators at a later date.

In point of fact, however, commercial quantities of oil or gas were not found during the primary exploration program. While there were a few encouraging signs of oil and gas accumulations, much more detailed work, probably taking a number of years, would have been required to prove or disprove the possibility of commercial production. Imperial did not feel it could continue further with the program, considering that lease rentals alone would amount to about 2 million dollars a year. Imperial's rights in most of this land block have now been surrendered.

The maximum amount of reservation acreage held under this project was about 3,975,000 acres. The expenditures were about as follows:

TABLE I

	Total \$
Land Costs - - - - -	1,463,000
Geological and Geophysical Surveys - - - -	3,404,000
Exploratory Drilling - - - - -	1,671,000
Total - - - - -	\$6,538,000

The above expenditures took place over a period of eight years. Considering a nominal cost of money of 6 percent per annum and applying it to the progressive and accumulated expenditures to the end of the project, the total cost becomes about \$8.4 million.

The above example illustrates the scale of expenditures that a primary explorer may have to make, often without any financial return. To stay in business, a company engaged in primary exploration must have large capital resources to start with and/or a substantial current income to support his exploratory efforts until those efforts can generate their own returns. Moreover, he can only justify the big expenditures that are required if there is a reasonable assurance of profit. To meet this condition, he must be ready and willing to continue his endeavors so that his successes can carry his failures and return a profit on the combined outlays.

CASE C

A Successful Exploration Venture of Imperial Oil Limited

Another area in which the costs and apparent results could be segregated readily was selected as the basis for Case C. Since this is a currently active area, the release of actual figures could conceivably prejudice the positions of other operators working there. For this reason, the sizes of the expenditures have been altered through multiplication by a common factor for purposes of disguise. Care has been taken to see that the economic results, which are stated in relative terms, were not altered. They portray the results of the actual operation to the best of Imperial's ability to judge these results at this stage.

Case C presents the results of an operation in which an exploratory program was carried on at a steadily increasing rate for a period of over five years before the first commercial oil production was found. Active exploration and development continued until Imperial's acreage holdings were

satisfactorily evaluated. Total expenditures up to the time of the first substantial production added up to about \$1.3 millions. Total expenditures of a capital nature (exploration and development costs), were about \$11.2 millions over the life of the program. This amounts to about 86 cents per net barrel of reserves acquired. Of this figure, about 47 cents per net barrel was in the form of acquisition expenditures and 39 cents per net barrel represented development capital costs. Operating expenses are relatively high, averaging 67 cents per net barrel. Imperial's net reserves are 13 million barrels.

On the basis of the above, total replacement costs are \$1.53 per net barrel and this gives the following indicated results which are shown in Table II.

TABLE II

		Future Worth (\$/Bbl.)	Present Worth at 6% (\$/Bbl.)
Realization	- - - - -	2.56	1.62
Replacement Cost	- - - - -	1.53	1.22
Margin before tax	- - - - -	1.03	0.40
Income Tax	- - - - -	0.40	0.21
Margin after tax	- - - - -	0.63 ✓	0.19

The rate of return* on this operation over an estimated 30-year producing life is expected to be about 11 percent after tax. By any standard, this is a very moderate return on risk money in a successful venture. The primary explorer must have before him the hope of much larger returns on his successful ventures to carry the losses of his unsuccessful exploratory projects such as was outlined in Case B.

CASES D AND E

Hypothetical Examples

It has been stated that an exploring company must normally carry on a continuing program to achieve a measure of success in the hit-and-miss business of oil finding. Not only must the search be continuous; it needs also to be carried on with a high degree of skill and efficiency and preferably with a touch of good fortune if the company is to flourish. The success of an exploratory program is measured by the cost of acquiring reserves.

The range of acquisition costs is very wide. To illustrate how heavily these costs can bear on a company's future, the progress of two hypothetical exploring companies was charted over a period of twenty years from their respective entries into the play. The two hypothetical companies, call them Company D and Company E, are represented by Cases D and E respectively. Company D has a continuing acquisition cost of 25 cents a gross barrel while Company E has an acquisition cost of 75 cents a gross barrel.

In order to validate the comparison, other conditions were made as comparable as possible between the two companies. Important conditions common to both companies were as follows:

1. Wellhead price — \$2.50 per barrel.
2. Royalty — 12½% of gross production.
3. Production — 6½% annually of remaining developed reserves.

*The rate of return was calculated using the discounted cash flow or so called "Investor's Method."

4. Operating costs — 50¢ per gross barrel.
5. Average reserves per well — 300,000 barrels.
6. Development capital investment was assumed to be \$85,000 per well.

In the calculation each company was assumed to commence operations with \$5 millions of equity capital.* No additional capital was invested during the period in the form of new equity; and in the first series of calculations, no issuance of funded debt was assumed. However, during the period of development of discoveries made during the early years, each company made use of short term financing to avoid a serious interruption of exploratory work while its income from production was being built up.

As the two hypothetical companies were used solely to demonstrate a principle rather than to reflect actual case histories, no capital realization in the form of dividends was provided for during the twenty-year period. Instead, all income in excess of requirements for operating, development, and other expenditures was assumed to be used in exploring for additional reserves.

The usual experience is for exploration success, particularly in the case of an individual company, to be cyclical in nature even if a fixed annual amount is provided for exploring. However, in the interests of simplicity, it was assumed that after a preliminary two-year period, discoveries each year would be in direct proportion to exploration expenditures.

In short, this projection attempts to reflect the progress of two companies operating under parallel conditions, but with different finding costs. In actual practice, results could vary considerably from those shown depending on financial policy in respect of debt financing and dividend payments, to say nothing of the effect of the timing of discoveries during the period.

Figure 4 shows the progress of Company D and Company E respectively in terms of the growth of remaining reserves. Figure 5 shows the progress of each company in terms of annual production. It will be noted that by the end of the twentieth year, Company D has remaining reserves of 76 million gross barrels, while Company E has remaining reserves of some 9.5 million gross barrels. In other words, with an acquisition cost for Company D equal to one-third that of Company E, reserves of the former company would be about eight times those of the latter at the end of the twenty years. The slopes of the respective remaining reserve curves in Figure 4 and the production curves in Figure 5 illustrate that Company D is able to finance from its own earnings a rapidly increasing rate of exploration and development, whereas Company E, reinvesting all its earnings, shows only minor growth. In fact, the rate of growth of Company E has been such that it hardly justifies the original investment in what is predominantly a high risk enterprise.

It is apparent from these examples that the future of a company with a relatively low finding cost is practically unlimited. Company D in our example would be in a position to expand at a much more rapid rate than we have shown. The rapid build-up of production and reserves would enable it to make use of borrowed funds and thereby expand its operations. To illustrate, if Company D borrowed \$5 millions at the end of the fifth year of operations (at which time the underlying security would be reserves in the order of 15 million gross barrels) its remaining reserves at the end of the twenty-year period would be some 100 million gross barrels, an improvement of 32 percent over the 76 million gross barrels it would have remaining if exploration were financed solely from its own earnings. This calculation was based on an interest rate of $5\frac{1}{2}\%$ per year on the outstanding balance of the debt which, it was assumed, would be repaid in equal annual instalments over fifteen years so that the company would be debt-free at the end of the period.

*Each company was assumed to acquire initially two 100,000 acre reservations, carrying out preliminary surveys to the same total costs in the first two years and drilling to discover oil in the third year. The initial exploratory programs were designed to use about half of each company's available capital in the first three years.

As an alternative to debt, or perhaps in conjunction with debt, Company D could readily obtain infusions of additional equity capital. The build-up of reserves of this company would under normal conditions enable shares to be sold at a price substantially above that of the original issue used to raise the \$5 millions assumed as the original equity base.

Company E would obviously have difficulty in expanding its operations to obtain results of greater magnitude than those shown in Figures 4 and 5. In fact, our calculations show that if money were to be borrowed, on the same basis as used in the illustration for Company D, Company E's position at the end of the twenty-year period would be no different from the original case using no funded debt. The carrying cost and repayment obligations in respect of the debt would reduce the level of exploratory activity in the later years by an amount sufficient to offset the short term expansion in reserves resulting from the use of the borrowed funds.

The foregoing illustration is designed to show that the level of acquisition costs over the long term is the key variable in the success of an exploration company. There is no doubt that the growth possibilities in a company that can achieve lower than average acquisition costs provide the incentive that attracts risk capital to the industry.

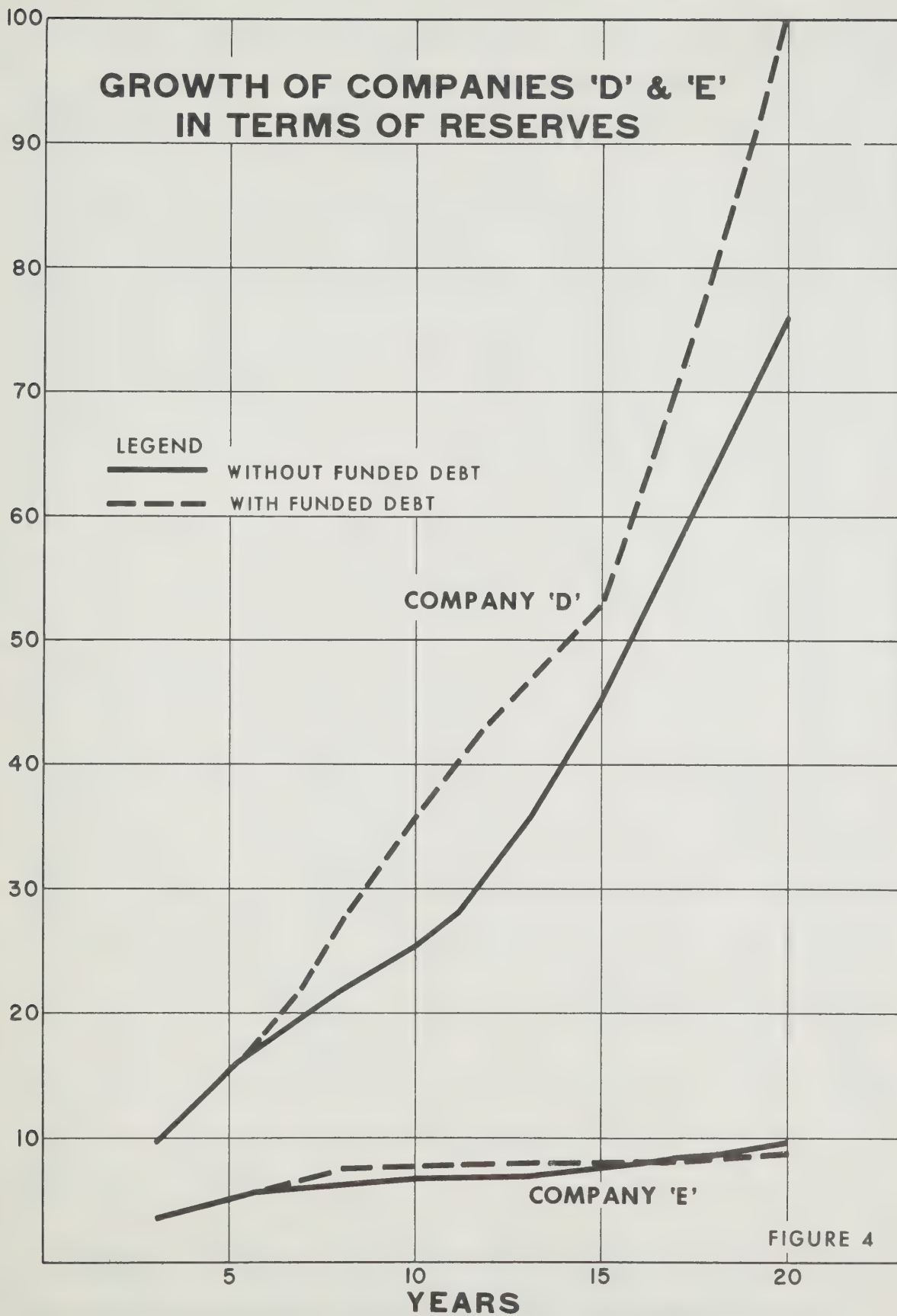
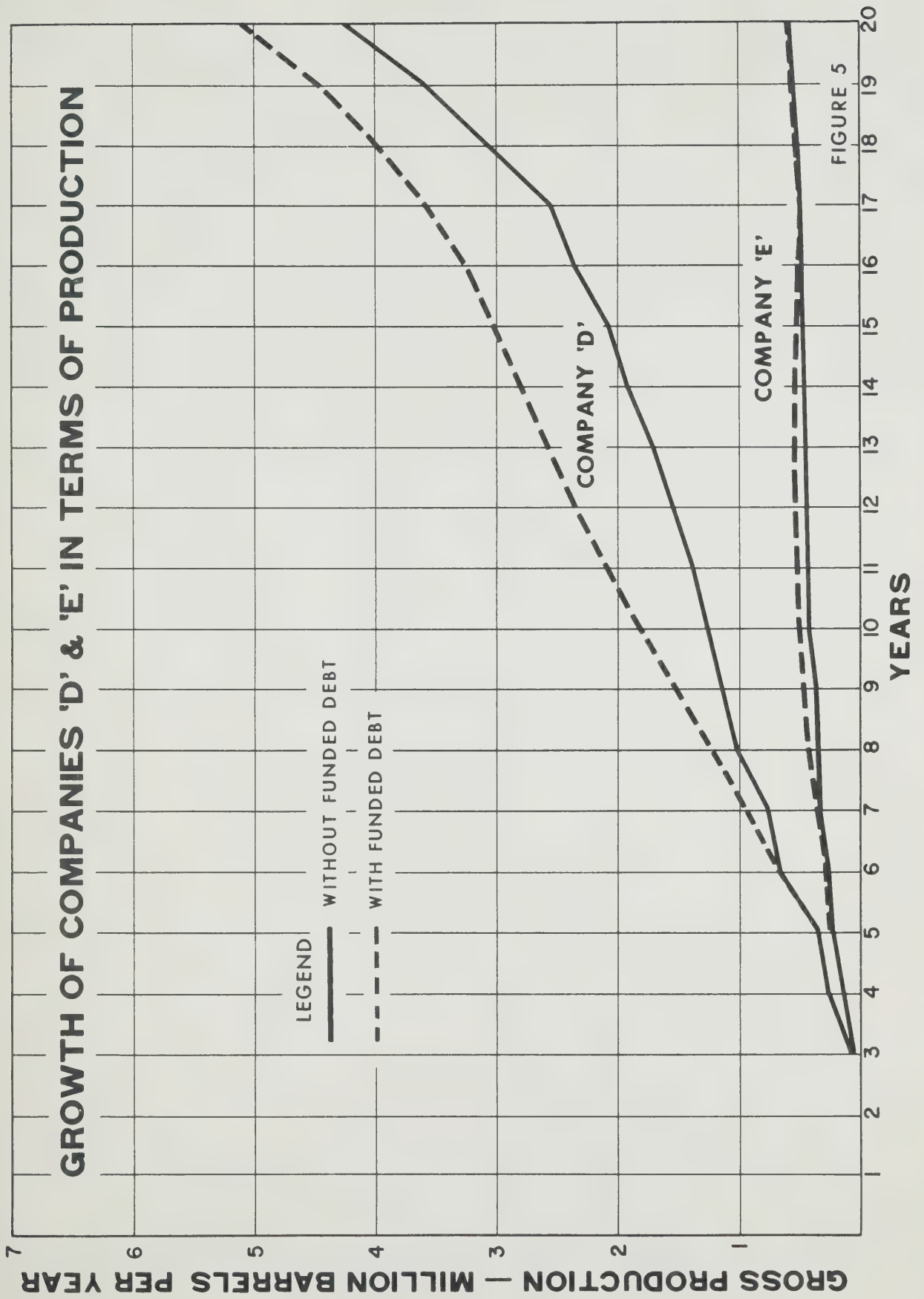


FIGURE 4



APPENDIX "D"

Re: FEDERAL PIPE LINES

Introduction

The Pipe Lines Act, R.S.C. 1952 cap. 211 was first enacted by the Parliament of Canada in 1949 in the exercise of its exclusive jurisdiction over interprovincial and international pipe lines. The scheme of this legislation was to prescribe the type of corporation which could construct, own and operate such pipe lines and to confer jurisdiction on the Board of Transport Commissioners in respect of the construction and operation of such pipe lines generally.

There have been two principal factors which have influenced the legislative position of pipe lines in Canada. One arises from the division of legislative power in Canada under the British North America Act whereby the Dominion Parliament was given exclusive jurisdiction over works and undertakings connecting one province with another or extending beyond the limits of a province. The other arises from the experience of the railways which were constructed in the latter part of the nineteenth century and the apparent desire of the Federal Government to avoid, so far as possible, the construction of undertakings which may prove to be uneconomical and presumably would become a burden on the country.

The current federal pipe line legislation in itself contains certain undesirable features and the fact that each of the provinces has legislative authority over wholly provincial lines creates further problems by reason of the duality of these legislative jurisdictions. Certain of these problems are discussed hereunder.

- I. "11. A company shall not, except as in this Act otherwise provided, begin the construction of a section or part of a company pipe line, until
- (a) the Board has by order granted the company leave to construct the line;
34. No company pipe line and no section thereof shall be opened for the transportation of oil or gas until leave therefor has been obtained from the Board."
- Pipe Lines Act, Revised Statutes of Canada, 1952, cap. 211.
- "6. Subject to section 24, no person shall commence the construction of a pipe line or any section thereof until the minister has granted a permit as hereinafter provided authorizing such construction.
21. (1) No permittee shall operate a pipe line until he has applied for and obtained from the minister an operating permit permitting the operation of the pipe line in accordance with such permit and the permit granted under section 12 and any amendments thereto.
- (2) Upon or before applying for an operating permit, the applicant shall furnish the minister with complete and detailed plans and specifications as prescribed by the regulations and such other information as the minister may require."
- The Pipe Lines Act, Statutes of Saskatchewan, 1954, cap. 83.

It is sometimes difficult to know whether a proposed work is within federal or a provincial jurisdiction. This may arise particularly in the case of a gathering line built in conjunction with a federal pipe line. In a borderline case, the owner will be in a dilemma to know where to apply for the necessary permissions he requires in either case and faces great risk of delay and expense should the authority to whom he finally decides to apply declines its jurisdiction. In the absence of a ruling by the courts, it would in fact be possible for both the federal and the provincial authority to decline jurisdiction based on their respective views of the nature of the proposed undertaking.

- II. “10A. No person, other than a person having authority under a Special Act to construct or operate pipe lines for the transportation of oil or gas, shall construct or operate an extra-provincial pipe line, but nothing in this section shall be construed to prohibit or prevent any person from operating or improving an extra-provincial pipe line constructed before the 1st day of October, 1953.”

Pipe Lines Act, Revised Statutes of Canada, 1952, cap. 211, as amended by Statutes of Canada, 2-3 Eliz. II, cap. 7, sect. 2.

Under the Federal Act only a Special Act Company may construct or operate an inter-provincial pipe line. While the historical reason for a Special Act Company is that the pipe line would be the basis of a quasi-monopoly and, therefore, the incorporation of the company should be by a special act of Parliament, the fact that jurisdiction over pipe lines is now held by the Board of Transport Commissioners would seem to have removed this requirement for parliamentary supervision of the incorporation of the company. The principal objection to an incorporation by special act is the delay entailed and the resultant inflexibility if the corporate powers are to be varied subsequently. Application for incorporation by special act must be made at the beginning of a session of Parliament. As these occur usually only once a year, delay is almost bound to result except in the case of a fortunate coincidence. Secondly, the passage of the bill for incorporation through Parliament is a tedious and time consuming one and inasmuch as the rules of the House limit the time that may be devoted to bills of this nature the bill is always liable to be talked out at the session thereby necessitating its re-introduction at a following session or its complete withdrawal.

Just as the enactment of the special act of incorporation is subject to delay so are any further amending acts which may be sought by the company to enlarge or vary its corporate powers. In the case of a letters patent company, these further powers are obtained by supplementary letters patent and are not subject to parliamentary review but in the case of a Special Act Company any change in its powers requires an act of Parliament in amendment of its act of incorporation.

- III. “An Act to incorporate Consolidated Pipe Lines Company”
Statutes of Canada, 3-4 Eliz. II, cap. 75.
- “An Act to incorporate Petroleum Transmission Company”
Statutes of Canada, 3-4 Eliz. II, cap. 76.
- “An Act to incorporate S & M Pipeline Limited”
Statutes of Canada, 3-4 Eliz. II, cap. 77.
- “An Act to incorporate Stanmount Pipe Line Company”
Statutes of Canada, 3-4 Eliz. II, cap. 78.
- “An Act to incorporate Trans-Border Pipeline Company Ltd.”
Statutes of Canada, 3-4 Eliz. II, cap. 79.
- “An Act to incorporate Trans-Prairie Pipelines of Canada, Ltd.”
Statutes of Canada, 3-4 Eliz. II, cap. 80.
- “An Act to incorporate Westspur Pipe Line Company”
Statutes of Canada, 3-4 Eliz. II, cap. 82.
- “An Act to incorporate Yukon Pipelines Limited”
Statutes of Canada, 3-4 Eliz. II, cap. 83.

A further consequence of incorporation by special act and of the resultant delay is the number of pipe line companies which are incorporated in a year in anticipation of one of them being empowered to build a particular line which may be in general contemplation. In 1955, eight such companies were incorporated although only two actually constructed lines.

- IV. “12. (3) Upon the application, the Board shall have regard to all considerations that appear to it to be relevant and in particular to the objection of any party interested, to a public interest that in the Board's opinion may be affected by the granting or the refusing of the application, and to the financial responsibility of the applicant.”

Pipe Lines Act, Revised Statutes of Canada, 1952, cap. 211.

“As guiding considerations, subsection (3) particularly refers to public interest and financial responsibility of the applicant. Among the additional factors or criteria which the Board, in conjunction with its economic, financial and engineering specialists has deemed relevant and has considered are: (a) design and other engineering features of the proposed line; (b) costs of construction and operation of the line; (c) comparative cost of financing of the debt and equity capital, as suggested by the Applicants; (d) skill, knowledge, experience and record of the parties who will be charged with the administration and direction of the respective undertakings; (e) the type of interest which the sponsors of the respective companies have in the area in question and their ability and incentive to further develop in an orderly fashion crude oil resources and increased throughput; (f) the significance of the items mentioned in sub-paragraph (e) in respect of costs of production and the likely effect thereon on expansion of markets and cost to consumers.”

Judgment of Mr. Justice Kearney, J. dated October 13, 1955, pursuant to Order No. 87142, The Board of Transport Commissioners for Canada.

Following incorporation by special act, the company must obtain from the Board of Transport Commissioners leave to construct and operate its line. It is difficult to find fault with the requirements of the Board in this connection so far as they relate to the location and route of the line, railway and water crossings and other matters designed to minimize interference with property rights and to ensure safe construction and operation. The Board, however, has also required evidence relating to reserves, production forecasts, availability of markets, proof of financial responsibility and of the support of producers in the area served by the proposed line. While this desire to ensure the economic success of the venture may be in the overall public good, it has had a tendency in the past to restrict the size of the proposed undertaking to its immediate requirements thus enhancing its chances of economic success but limiting its capacity to handle increased volumes as markets expand save at the increased cost of further expansion. It would seem that the public should be, and is already adequately protected in respect of any investment it may make in the company under the provisions of the present Federal and Provincial Securities laws and that it is a duplication of effort for the Board to concern itself with the above matters.

- V. “38. This Part applies in respect of company pipe lines for the transportation of oil and to companies operating such lines.
39. The Board may, by order, declare a company to be a common carrier whether the company has or has not acted or held itself out as a common carrier, and the expression “common carrier” in the following sections of this Part means a company that has been declared by the Board to be a common carrier.
40. The Board may make orders and regulations with respect to all matters relating to traffic, tolls or tariffs.
42. A common carrier shall not charge any tolls except tolls specified in a tariff that has been filed with the Board and is in effect.
43. All tolls shall be just and reasonable, and shall always, under substantially similar circumstances and conditions with respect to all traffic of the same description carried over the same route, be charged equally to all persons at the same rate.

44. The Board may disallow any tariff or any portion thereof that it considers to be contrary to any of the provisions of this Act or to any order or regulation of the Board, and may require a company, within a prescribed time, to substitute a tariff satisfactory to the Board in lieu thereof, or may prescribe other tolls in lieu of the tolls so disallowed.
45. The Board may suspend any tariff or any portion thereof before or after the tariff goes into effect."

Pipe Lines Act, Revised Statutes
of Canada, 1952, cap. 211.

Another feature of the Federal Pipe Lines Act is the power that is conferred on the Board to declare an oil pipe line company to be a common carrier and to then regulate all matters in regard to traffic and tariffs. This provision together with the prohibition in the Act from selling or abandoning the operation of any pipe line save with the consent of the Board illustrate the common carrier or public utility concept which Parliament appears to have had of this type of pipe line. The oil pipe line does not fit into this concept. We suggest that in the case of oil pipe lines the dangers sought to be safeguarded by these provisions are already provided for to some extent under the Combines Act and further would be obviated if the single permit system presently followed by the Board were to be discontinued.

